THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. APRIL 20, 1899. CHICAGO, ILL. NUMBER 16

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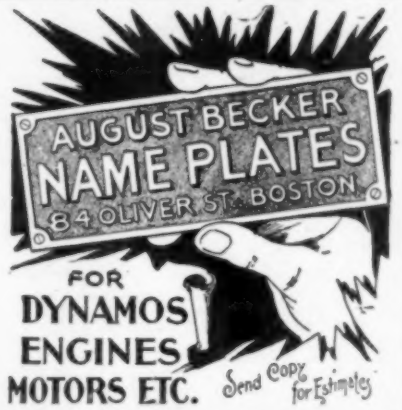

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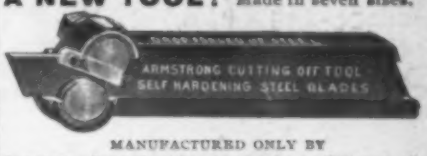

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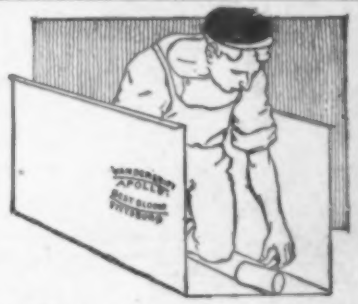

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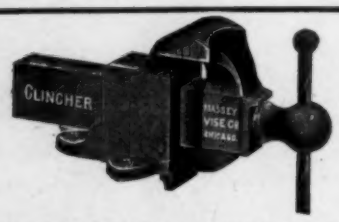

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THE IRON TRADE REVIEW

VOLUME XXXII. CLEVELAND, O. APRIL 20, 1899. CHICAGO, ILL. NUMBER 6

THE WEEK IN IRON CIRCLES.

THE MARKET AT LARGE.

Another week of comparative quiet has come to the iron trade, but without any development tending to change the situation materially or pointing to anything but a continuingly firm market. The fact that mills are crowded and that many of them are even less able to care for immediate orders than in earlier weeks of the year, owing to spring specifications, is one side of the present lull; on the other side is the probability that some buyers anticipated their wants, in their purchases and specifications of some weeks ago, and accumulated some material against the spring rush. It is true, too, that the condition of affairs at the mills is now so thoroughly known that buyers for the time being are letting them alone. Pig iron stocks are the only statistical gauge of consumption. These, taken in connection with blast furnace production reports, indicate that in March consumption reached high water mark. Stocks at furnace yards were lowered 115,000 tons last month and the net withdrawals from warrant yards were 16,000 tons more. Production passed from a rate of 228,195 tons a week on March 1 to 245,746 tons a week on April 1, so that the weekly average in March was between the two figures. The apparent consumption in March was thus not far from 1,175,000 tons, or at the rate of nearly 14,000,000 tons a year. It would be difficult to gauge the relative increase of consumption in foundry and in Bessemer irons; but it is plain that the situation of the foundry furnaces has been fairly revolutionized since the gathering of statistics one year ago, on which was based the movement for an association of foundry furnaces to relieve them from their calamitous condition. It would be only good guess work to attempt to estimate the output of foundry ion furnaces likely to be blown in before mid-summer, and how far their output would go toward off-setting the present inroad on stocks, presuming that no stacks now running went out meanwhile. More time must be allowed for any exact statement concerning the second half of the year; but thus far the wait has rather begotten a stronger feeling. With all the stimulus gone, that came from buyers' efforts to insure themselves for later months, as in February and March buying, prices stay where the buying movement left them—a proof of the exceptionally strong conditions everywhere. The scarcity of steel is still commented upon by mills that buy billets and sheet bars. Central Western steel works, closely sold as they are for the second quarter, and with so large a proportion of their product placed in advance with allied interests, now that the American Steel Hoop Co. has become operative, are in a position which promises no immediate change from the present piece basis. The demand for every form of Bessemer steel is so insistent that every converter will be kept blowing to its utmost capacity for the balance of the year. Sales of billets at $25.50 Pittsburg are reported, and even higher figures have been reached for prompt steel. Pittsburg mills have had a quiet week so far as regards new business; but with the exception of the wider sizes in structural material are able to entertain practically nothing that calls for early delivery. Chicago has had a steady run of structural business and reports 5,000 to 6,000 tons additional this week. The rail mills can take very little more for 1899 delivery. The 75,000-ton contract reported taken by the Maryland Steel Co. for the Chinese Eastern road is only the familiar 80,000-ton Trans-Siberian order of some months ago, reduced by 5,000 tons when the business came to be placed finally, after having been once canceled. The cast iron pipe consolidation has made some bids at Chicago and Detroit the past week, that show an advance of $7.50 a ton over last year's low prices. Apart from advances in pig iron and labor, this represents about $3 net to the company, above the old basis. Of the unlaunched consolidations, reports agree that present efforts promise results in due time. Appraisers and accountants are still at work at various bridge works. The sheet mill consolidation has not been abandoned, as reported, but a general meeting is expected at an early date. The Republic Iron & Steel Co. promoters have still a number of important unsettled matters between them and the perfection of their plans. In the past week some of the valuations have been subjected to searching scrutiny, with the result that owners' figures have been reduced materially in a number of instances. It is now considered likely that the new company will be ready for business by May 1.

PITTSBURG.

OFFICE OF *The Iron Trade Review and Industrial World*,
705 PUBLICATION BUILDING, April 19.

There has been no material change in the general situation in iron and steel. So far those who have predicted that some weakness would develop by this time have missed their guess, and the past week has developed slight indications rather that the market may be firmer later on than it is now. A small sale of steel, for delivery in the third quarter, has been made at a price higher than that ruling for delivery in the second quarter. In a number of lines there is very little inquiry, but deliveries are still very unsatisfactory. It is being realized more and more that increased furnace capacity can be depended on to but a limited extent to relieve the situation, and it is claimed that against this must be set the certainty of an increased demand in finished lines in the latter half of the year. But on the other hand two very important factors must be considered; the influence which the present high prices must have on demand, and the increased quantity of material available for domestic use due to the lessened exports in raw material. Many of the advances which have come in iron and steel lines have been due to the urgency of buyers who absolutely had to have the material. As matters adjust themselves, and the question of buying is one of choice and not necessity, there will be an influence toward easier prices.

But no definite forecast of the probable level of prices for the second half can be made yet.

PIG IRON.—Following the rapid advances recently made, the pig iron market has settled into a condition of decided quiet, with buying only of the most moderate order. The valley price for Bessemer is firmly fixed on the basis of $14.50 at the furnace, but only a few thousand tons have been sold since the rather heavy sales made on the original adoption of this price. In foundry iron there have been some moderate sales, at about the former range of prices. Some comparatively heavy selling has been done in charcoal iron. In gray forge we note a sale of 1,500 tons at $14.50, while on small lots and special deliveries it is claimed even higher than this has been done. We continue to quote as follows:

Bessemer, valley furnace	$14.50
Bessemer, Pittsburg	15.15 to 15.25
No. 1 Foundry	15.75 to 16.00
No. 2 Foundry	15.50 to 15.75
No. 3 Foundry	15.00 to 15.50
Gray Forge, valley furnace	14.00 to 14.50
Gray Forge, Pittsburg	14.25 to 14.50

STEEL.—There has been no general selling of steel billets for the third quarter. A small lot is reported to have been sold at $26.50. For delivery before July 1 there is practically no steel available direct from mills, and steel from second hands is steadily held at $25.50. The mills are still far behind on deliveries, and it is probable that the first day of July will find them on an average of six weeks behind. No sales of sheet bars in the open market have been heard of.

FERRO-MANGANESE.—The minimum of $75 for 80 per cent is well maintained, and for small lots considerably higher prices are quoted.

RAILS AND TRACK MATERIAL.—There is no change in the rail market, the price being $25 for heavy and light sections, down to 25 pounds to the yard. In track material the demand keeps up, with prices unchanged, and we still quote: Spikes, 1.80c to 1.90c; track bolts, 2.20c to 2.40c; splice bars, 1.50c to 1.70c; links and pins, 1.80c to 1.90c.

BARS.—The market is still stronger in bars, and we quote $1 a ton higher, 1.65c to 1.75c for steel bars and 1.60c to 1.70c for iron bars.

STRUCTURAL MATERIAL.—The demand for structural material continues very satisfactory. Prices remain unchanged as follows: Beams and channels, 3 to 15 inches, 1.50c; 18 to 24 inches, 1.60c; tees 1.55c; zees, 1.50c; and angles, 1.50c to 1.55c; universal mill plate, 2c.

PLATES.—The plate market is very firm. Plates for immediate delivery are not to be had, and for early delivery a decided premium must be paid, in some cases a price as high as 2.25c for tank. The price is largely a question of delivery. Tank plate for delivery before July 1 brings all of 2.10c; for July and August 2c could be done, and for delivery later a somewhat lower figure. We quote for delivery up to July 1, tank, 2.10c; shell, 2.20c; flange, 2.30c; fire box, 2¼c to 3¼c.

SKELP.—Skelp material is very scarce for delivery within the next few months, and fancy prices have to be paid. Sheared steel skelp is particularly scarce, and brings fully 2c for delivery in the next three months. Grooved steel skelp is easier than sheared, and we quote 1.75c. Grooved iron skelp is about 1.70c.

PIPES AND TUBES.—The pipe mills generally are too full of work to book any large contracts. The latter part of last week one of the mills had to turn down an order for 30 miles of 10-inch line pipe, which was, however, taken by a local mill on Friday. The same mill received an order through a Cleveland jobber for 25 miles of 5-inch 10-pound line pipe, to be used in the beet sugar industry out West. We quote prices unchanged as follows: Merchant pipe, base discount 60 per cent and additional discounts four 10's for less than carloads and four 10's and 5 for carloads, with free delivery on the latter within the prescribed territory; lap weld casing, 52½ for screw and socket joint and 47½ for inserted joint, with 5 per cent additional on carload orders; boiler tubes, 1¼ to 1½-inch, 45 per cent; 1¼ to 2½-inch 55 for iron and 60 for steel; 2¼ to 6-inch, 60 for iron and 62½ for steel, all with an extra 5 per cent to dealers.

SHEETS.—The only change in the sheet market since last report is that the scarcity is becoming still more pronounced. The mills have scarcely anything in the lighter gauges to offer, while supplies in second hands are being held at good figures. We quote 2.75c to 3c for No. 28 common. There is no business doing except for nearby delivery, and mills are unable to obtain supplies of steel to run them satisfactorily. In galvanized there is less tension, and the market is moderately active at 75 per cent off.

SPELTER.—The spelter market has moved up again and the St. Louis market is quoted at 6.35c to 6.40c; Pittsburg 6.45c to 6.50c; and New York 6.65c to 6.70c.

OLD MATERIAL.—The scrap market is without any very decided change. There is less demand on the part of mills than there was a month ago. Melting scrap is quoted easier, and old iron rails are temporarily higher. Otherwise we quote last week's figures: New melting stock, $13.50 to $13.75; old steel rails, long lengths, $12.50 to $13; cut, $13 to $13.50; old iron rails, $18 to $18.50; wrought iron scrap, $15 to $16; cast borings, $8, net, Pittsburg; busheling scrap, $11 to $11.50, net; car wheels (nominal), $14 to $14.50, gross; cast scrap, $12, gross; charcoal scrap, $13, gross; wrought turnings, $8 to $8.50, net, Pittsburg.

COKE.—The increased inquiry for furnace coke, due to plans for blowing in idle furnaces, has developed the decidedly strong position of the coke market, and strictly Connellsville furnace coke cannot be had below $1.90, while as high as $2 is quoted. Foundry and crushed are held at $2.15 to $2.30.

CHICAGO.

OFFICE OF *The Iron Trade Review and Industrial World*,
1522 MONADNOCK BLOCK, April 19.

The market has been quiet the past week, with almost no changes in the condition of affairs. The demand for most classes of iron and steel is large, and sales are of good size, although they have been limited in many cases by the inability of the mills and furnaces to accept business offered because of the requirements as to quick shipments.

PIG IRON.—Considerable business was done in small lots no very large orders having been closed. There are in the market at present several quite large inquiries, which will probably be closed up within a short time. Otherwise there has not been much activity. Furnacemen are very firm, and most of them hold to the opinion that there is still likelihood of a shortage of iron before the middle of the year. Southern furnaces are sold ahead for from three to six months, and many of them are out of the market except on a few grades. None of them are in shape to make prompt shipment on any grades. There are no changes in prices.

Lake Sup. Charcoal	$17 00 @ $18 00	Southern Coke No. 3	$14 75 @ 15 00
Local Coke Fdy. No. 1	15 50 @ 15 75	Southern No. 1 Soft	15 50 @ 16 00
Local Coke Fdy. No. 2	15 00 @ 15 50	Southern No. 2 Soft	15 00 @ 15 50
Local Coke Fdy. No. 3	14 50 @ 14 75	Southern Silveries	15 50 @ 16 00
Local Scotch Fdy. No. 1	15 50 @ 15 75	Jackson Co. Silveries	17 00 @ 18 00
Local Scotch Fdy. No. 2	15 00 @ 15 50	Ohio Strong Softeners	15 50 @ 16 50
Local Scotch Fdy. No. 3	14 50 @ 14 75	Alabama Car Wheel	17 50 @ 18 00
Southern Coke No. 1	16 00 @ 16 25	Malleable Bessemer	15 50 @ 16 00
Southern Coke No. 2	15 25 @ 15 75	Coke Bessemer	15 50 @ 16 00

BARS.—The market is still unsettled, owing to the fact that no definite announcement has been made of the plans of the Republic Iron & Steel Co. Arrangements are still being made for the completion of the consolidation, and it is thought the final announcement will be made within a few days. Rumors are current, however, that some financial difficulties have caused delay, and may stop the whole proceedings. Sales last week were of fair size, and included several quite large contracts. The demand is good. Prices are unchanged at 1.57½c for common iron, and 1.55c to 1.65c for soft steel bars, mill shipment.

STRUCTURAL MATERIAL.—Sales have been large, the bulk of the business being of the small lot order. Among contracts closed in the week were one for 2,000 tons and another for 1,000 tons of bridge material, a third for a building in Chicago, taking 1,000 tons, and one for a building at Des Moines, calling for several hundred tons. A contract for 5,000 tons of bridge material will be placed by the Chicago & Alton this week. Part of this is for a bridge over the Mississippi River, and part for a number of smaller bridges. There are also several other good sized deals in the market, all of which will be closed soon. Prices are unchanged. Quotations are as follows: Beams, 15 inches and under, 1.65c to 1.70c; 18 inches and over, 1.75c to 1.80c; angles, under 3 inches and over 6 inches, 1.75c to 1.80c; 3 inches to 6 inches, 1.65c to 1.70c. Sheared plates, 2.25c to 2.30c; universal plates, 2.25c to 2.30c; tees, 1.70c to 1.75c; zees, 1.65c to 1.70c. Small lots from stock are quoted at ¼c to ½c higher.

BILLETS AND RODS.—There have been no sales of either bil-

lets or rods in the Chicago district in the past week. Prices are nominally as follows: Bessemer billets, $25.50 to $26.50; open-hearth billets, $28; rods, $32 50.

PLATES.—The sales of plates last week were large, and included several good sized contracts. Most mills are not in shape to handle business for anything like immediate delivery, and this has a tendency to limit tonnage. Mill shipment orders are consequently not as large as they would be. Store orders are excellent, and good prices are obtained for all business offered. Quotations are unchanged as follows: Tank plates, 2.25c to 2.30c; flange steel, 2.35c to 2.45c; marine steel, 2.45c to 2.55c; fire box steel, 3c and upwards.

SHEETS.—Orders were of fair size and would have been larger had more mills been willing to accept the business offered them. Store orders constituted the bulk of the business, and were of large dimensions. Quotations are made at 2.75c to 2.85c for No. 27 common, and 70 and 7½ to 70 and 10 off for galvanized.

RAILS AND TRACK SUPPLIES.—No business has been done by the local mills, with the exception of a few small orders for light rails. We quote: Standard section rails, $25 to $26; light rails, $25 and upwards; steel splice bars, 1.40c to 1.50c; track bolts with square nuts, 1.80c to 1.90c; hexagon nuts, 1.90c to 2c; spikes, 1.55c to 1.60c.

MERCHANT STEEL.—Sales last week were of good size, and included a number of quite large contracts. The demand shows no indication of becoming any smaller than it is at present. Quotations are as follows: Open-hearth spring, tire and machinery steel, 2.40c to 2.45c; smooth-finished machinery steel, 2.45c to 2.55c; smooth finished tire steel, 2.25c to 2.35c; tool steel, 6c to 7.50c; specials, 10c and upwards.

WIRE AND WIRE NAILS.—Orders last week were plentiful and large, and made a good aggregate. The demand appears to be increasing somewhat. Advances were made in prices last week, and they are now quoted as follows: Plain wire, $1.95; galvanized, No. 14 and heavier, 50c advance; Nos. 15 and 16, 85c advance; Nos. 17 and 18, $1.10 advance; wire nails, $2.10; barb wire, painted, $2 20; galvanized, $2.70. All prices are f. o. b. Pittsburg and Cleveland, and on carload shipments all rail freight is added, making a delivered price. Single carload lots are quoted 10c higher.

SCRAP.—Sales of scrap to mills are not large, and probably will not increase materially until after the bar mill consolidation is an accomplished fact. Foundry grades of scrap are in large demand, and good sales were made last week. Dealers' selling prices are as follows:

Old iron rails, gross,	$17 00@$18 00	Axles, net	$17 00@$17 50
Old steel rails, long, gr.	11 75@ 12 00	Cast borings, net	6 00@ 6 50
Old steel rails, short	11 00@ 11 50	Wrought turnings, net	7 25@ 7 75
Old wheels, gross	16 50@ 17 00	Axle turnings, net	9 50@ 10 00
Railroad forge, net	15 00@ 15 50	Mixed steel, gross	8 00@ 8 50
Dealer's forge, net	11 50@ 12 00	Stove plates, net	8 00@ 8 50
No. 1 mill, net	9 [illegible]@ 10 00	Heavy melting steel, gr.	11 00@11 50
Heavy cast, net	13 00@ 13 25	Old iron splice b., net.	16 00@16 25
Malleable cast, net	8 50@ 9 50		

CLEVELAND.

OFFICE OF *The Iron Trade Review and Industrial World*, 27 VINCENT ST., April 19.

The late opening of navigation is having its effect on dock stocks of iron, which are being drawn upon by the furnaces at a rate more than making up for the unexpectedly slow movement from some docks in mid-winter. There is not yet the basis of any definite prediction concerning the opening of ore traffic with Lake Superior; but in general the developments of the week have been much more favorable, the warm weather having made its impression upon the ice. Yet cold nights are still the rule in Lake Superior ports, and the break-up while sure is necessarily slow. Some vessel firms are figuring on starting boats from Lake Erie ports by the 25th or soon after. Iron ore firms are still in receipt of inquiries from persons interested in furnace resuscitation plans, and there is evidence that some projects are likely to fall through for lack of ore. Pennsylvania ore pits will be worked that have been idle in years, and with the addition of New York and foreign supplies, a shift will be made in some cases, in the absence of Lake Superior ores. In reported resales, or in sales of small lots from first hands, prices recently realized have been from 75 cents to $1 above the opening basis.

PIG IRON.—Reports of stock reductions for March agree that the greatest inroad on stocks was made in the Mahoning and Shenango valleys—an index to the strength of the situation in Bessemer iron. There have been no sales by valley furnaces in the week and the market remains nominally $14.50 at valley furnace, with an additional 65 cents for Pittsburg delivery. Bessemer steel production continues at the highest notch, and the situation is shaping week by week for a continuance of the present relation between consumption and production practically through the year. In the foundry trade there is perhaps more inquiry than in the preceding week, principally from foundries that need more iron for the second quarter than their contracts of 1898 provided for. Furnace firms note with some satisfaction the lull in the business for the second half. Meantime the quotations of $14.50 for No. 2 and $15 for No. 1 at valley furnace are maintained, and some sales have made at higher figures. We quote forge iron nominally at $14.25 to $14.50, valley furnace, but no transactions are reported. Lake Superior charcoal continues firm at $17; water shipments are delayed considerably beyond what was expected. A Detroit furnace is going in blast, and at Munising, Mich., a new furnace is projected with indications of an early beginning of construction work. We quote the Cleveland market:

Bessemer	$15 75	Valley Scotch No. 1	$15 75@16 00
No. 1 Strong Foundry	15 65@15 90	Valley Scotch No. 2	15 25@15 50
No. 2 Strong Foundry	15 15@15 40	Gray Forge, valley	14 00@14 50
No. 3 Foundry	14 75@15 00	Lake Superior Charcoal	16 50@17 00

FINISHED MATERIAL.—Buyers who supplied themselves in March, anticipating that the opening of the season for outdoor operations would bring a rush of specifications to the mills, are letting the market alone; but there is a steady run of small-lot business, much of which finds its way to jobbers. No changes in mill prices are to be noted, nor is there any improvement in mill deliveries. Activity in building lines is noticeable. One order for 100 tons of structural material is reported for a private house. Tonnage of this sort, due to the desire of the builders of fine houses to insure against fire horrors, may become an increasing factor. There is no change in the mill prices noted last week: Beams and channels, 1.50c, Pittsburg; steel bars, 1.60c to 1.70c, Pittsburg; tank plate, 2c to 2.25c; No. 27 common sheets, 2.60c to 2.65c, Pittsburg mill; bar iron, 1.50c, valley. Prices out of stock, Cleveland, are as follows: Bar iron, 1.60c, half extras; machinery steel, 2c rates, half extras; No. 27 sheets, 3c; galvanized, 70 and 10 off. In wire nails an advance has been made to $2.10 in carload lots, Cleveland mill. The new quotation on plain wire is $1.95; galvanized, No. 14 and heavier, 50c advance, with greater advances on smaller gauges; barb wire, painted, $2.20; galvanized, $2.70.

OLD MATERIAL.—Mills are not buying old material pending transfers to the consolidated company. On foundry scrap dealers have little difficulty in getting asking prices. We quote old iron rails at $18.50 to $19, valley; old steel rails, $13.50 to $14; old car wheels, $16, Cleveland; No. 1 railroad wrought scrap, $16, valley mill; busheling scrap, $12; machinery cast scrap, $12; wrought turnings, $9 to $9.50; cast borings, $8; old iron axles, $18.50 to $19.

CINCINNATI.

April 18.

There are many signs of re-awakening interest on the part of consumers of pig iron. Inquiries are more frequent and the total tonnage of the past week, while not overly large, still was larger than the tonnage of the previous week. It is probable that the publication of the March statistics has brought about this increased demand. There are no concessions in prices obtainable and there is no anxiety on the part of any of the Southern companies, at least, to sell. The situation appears as strong as it possibly can be. From data at hand, it is reasonable to believe that stocks at the furnaces and warrant yards went off during March fully 130,000 tons; almost, if not quite, double the average monthly shortage the past year. The furnaces in blast, with the orders they have on their books, are unable to relieve the situation, but report that they are doing their utmost to provide iron, though no satisfactory relief can be had until lake navigation opens and the few Southern and Eastern furnaces arranging to blow in can make some iron to meet the extraordinary demand.

It is predicted by selling firms that if consumption continues upon the present plane of approximately 1,200,000 tons per month, the increased production to be realized in June and July

will be needed for current melt and the present prices maintained. The business of the week has been in all classes of iron. We quote for cash f. o. b. Cincinnati: Southern coke, No. 1 foundry, $15.25; No. 2, $14.25 to $14.75; No. 3, $13.75 to $14.25; No. 4 and gray forge, $13 to $13.50; mottled, $13 to $13.50; No. 1 soft, $15.25; No. 2 soft, $14.25 to $14.75; Lake Superior coke, No. 1, $16.25 to $16.50; No. 2, $15.75 to $16; Hanging Rock charcoal No. 1, $17 to $18; Jackson Co. silvery No. 1, $17 to $17.50; Standard Georgia car wheel, $15.75 to $16.50; Lake Superior charcoal, $18.75 to $19.25.

PHILADELPHIA.

April 18.

There is no change in prices in any line to note for the present week. And while quietness is sometimes the forerunner of weakness it cannot be said that the feeling of strength evident in every department of the market for many weeks past has abated in any particular. Current quotations are accepted as entirely in accord with conditions. Sellers are not after higher prices; in fact they are doing what they can, and have been working in the same direction for some time, to prevent an unwarranted advance, that must ultimately result in disastrous reaction. The fact that March production of pig iron increased about 15,000 tons a week, and that stocks decreased about 30,000 tons a week would indicate enormous consumption. There are expectations on the part of some in the trade, of an increase in production in April, May and June, that will go far toward overtaking the excess of consumption, but on this point there are varying opinions. It is very evident that the pig iron statistics have caused a stronger feeling, though this does not appear as yet in prices. Buyers, however, do not find furnaces ready to quote unless on a direct inquiry for a certain amount of iron, with specified deliveries. We continue to quote No. 1X foundry at $16.50 to $17; No. 2X foundry $15.75 to $16.25; No. 2 plain $15.25 to $15.50; mill and basic, $15 to $15.25; low phosphorus, $18.50 to $19.50. The steel market is quiet. The difficulty of getting billets is not lessened. The present range is about $27.50 to $28. Finished material is in as great demand as ever, and mills continue to be just as crowded as for the past two months. Deliveries are difficult to get and buyers offer premiums to get small lots that can be worked in by special effort. We quote refined bars at 1.50c to 1.60c; steel bars, 1.70c to 1.75c; tank plates, 2.20c to 2.30c; angles, 1.65c to 1.80c; beams and channels, 1.65c up to 15 inches.

BUFFALO.

April 18.

The past week has been one of much needed quiet. There is no pig iron to offer and buyers as a rule being covered until June and July are not in haste to place orders for the last half. This both buyers and sellers regard as a satisfactory condition, particularly to the producer by whom an order is the last thing that can well be considered. Sales are being made daily in a small way, lots of one carload to 1,000 tons on the basis of prices given below, which are for cash f. o. b. cars Buffalo: No. 1 strong foundry coke iron, Lake Superior ore, $15.50; No. 2 strong foundry coke iron, Lake Superior ore, $15; Ohio strong softener, No. 1, $15; Ohio strong softener, No. 2, $14.50; Jackson county silvery, No. 1, $15.50; Southern soft No 1. $16; Southern soft, No. 1 $16; Southern soft, No. 2, $15.50; Lake Superior charcoal, $14.50 to $15; coke malleable, $15.

American Steel Hoop Co.

The American Steel Hoop Co. was formally organized in New York on Tuesday, April 18. The election of officers resulted as follows: President, C. S. Guthrie; first vice-president, C. A. Painter; treasurer, F. S. Wheeler, secretary, F. L. Clark. Directors: C. S. Guthrie, C. A. Painter, George E. Painter, Veryl Preston, W. E. Taylor, R. M. Gilbert, W. T. Graham, F. S. Wheeler, D. G. Reid, W. E. Reis, Henry Wick, J. H. Moore, W. H. Moore, W. B. Leeds, and J. J. Treacy.

On Monday at 3 o'clock the time expired on which the subscriptions were to be paid in, and on Monday and Tuesday the final transfers of the plants were made, so that the American Steel Hoop Co. is now in full control of the properties. The concern has leased a portion of the First National Bank Building on the corner of Wood st. and Fifth ave., Pittsburg, and will open general offices there on the first of May. The offices leased have been vacated lately by the Western Union Telegraph Co. The company has a capital stock of $33,000,000 divided into $14,000,000 7 per cent preferred, and $19,000,000 common. The plants that have been taken over are the following: J. Painter & Sons Co., Isabella Furnace Co., William Clark Sons Co., Lindsay & McCutcheon, of Pittsburg; Union Works of the National Steel Co., of Youngstown, O.; Monessen Steel Co., of Monessen, Pa.; P. L. Kimberly Co., of Staron, Pa.; Portage Iron Co., of Duncansville, Pa.; and the Pomeroy Iron & Steel Co., Pomeroy, O. The close relation between the new company and the National Steel Co. is indicated by the personnel of the directory above. With the tin plate and hoop and cotton tie outlets, the National Steel Co. has a market at hand for more than half its product.

The Sheet Mill Consolidation.

Some erroneous reports have been circulated to the effect that the negotiations for the consolidation of the sheet mills had been dropped, at least temporarily. This is incorrect, although the progress has not been as rapid as was to have been expected. A number of conferences have been held in the past two weeks, and matters are being slowly arranged. The personnel of the management has not yet been definitely decided upon, but probably will be shortly, while the matter of appraising the plants is receiving attention.

MARQUETTE advices refer to the organization of the Munising Furnace Co., for the erection of a charcoal furnace at Munising, Mich., and the building of charcoal kilns and a by-product plant. The company is to be capitalized at $250,000 and will have in its directory representatives of important iron, railway, charcoal and spirit interests. W. H. Hinkle, of the Ashland Iron & Steel Co., Ashland, Wis., is named as president of the company, and H. H. Brown, of H. H. Brown & Co., Cleveland, as one of the directors. Details as to construction are not settled as yet, but will be announced in due time. Munising has had a rapid development in the past few years, and its harbor is one of the best on the south shore of Lake Superior. The timber interests of the district south of Munising are an important factor in its life, and the Munising Railway, which connects with the Chicago & Northwestern gives it an excellent outlet on the land side.

A MEETING of some of the boiler manufacturers of the country was held in Philadelphia recently, at which the matter was broached of forming a consolidation of all the interests of the country. No definite action was taken, as the representation was not considered sufficiently large. A second meeting has been called, to be held at the Manhattan, New York, this week, to consider the plan further.

THE regular monthly meeting of the Engineers' Society of Western Pennsylvania was held in the society's house in Pittsburg last Tuesday evening. The paper of the evening was entitled "High Speed Engines," by Arthur Herschmann, Pittsburg representative of Wm. Sellers & Co., Philadelphia. The following were elected to membership in the society: William Ahlen, chief draughtsman, Duquesne Steel Works and Blast Furnaces; Carl B. Auel, Westinghouse Air Brake Co.; Charles H. Bradley, Jr., of C. H. Bradley, Jr. & Co., engineers; Runhardt Daae, draughtsman for Julian Kennedy, Pittsburg; George W. Knotts, mechanical engineer for National Rolling Mills; Frank S. Loeb, assistant superintendent Duquesne Reduction Co.; Robert McLaughlin, draughtsman for Westinghouse Machine Co.; Henry Otto, master mechanic, Schoenberger Steel Works, and William O. Renkin, mechanical draughtsman for Pittsburg Plate Glass Co.

THE executive committee of the Pan-American Exposition Co., Buffalo, in the selection of a site for the exposition has decided in favor of what is known locally as "The Front," a park site overlooking Lake Erie and the Niagara River, and on which is located Fort Porter. It contains 180 acres, of which 91 acres are under water.

It is expected that Etna Furnace at Ironton, O., will be in blast by June 1.

A SOUTHERN VIEW OF THE OUTLOOK.

The London *Iron and Coal Trades Review* prints the following from James Bowron, 1st vice-president and treasurer of the Tennessee Coal & Iron Railroad Co., in answer to its inquiry concerning the iron trade situation in the United States and the outlook:

We used to have an old saying in England when I lived there that "All signs fail in dry weather." I rather feel like quoting it at present. In other words, the flood of consumptive requirements that has come upon the market in this country after five years of fiscal, economic and political disquietude, has been so great that it has surpassed any previous moment, and I do not think the most experienced of us, or the most thoughtful, can express anything more than a mere matter of opinion as to its continuance, increase, or decrease; and really that is the factor that would control the answer to your questions.

Every effort is being made to increase the production of coal, coke, iron and steel; but your familiarity with such matters would suggest undoubtedly the difficulties to be encountered. Blast funaces which have been in the hands of creditors are being sold, and such sales require confirmation by courts; others are being put in order and overhauled, and examinations develop more or less need for repairs and improvements, and the necessary material for such repairs cannot be had with the usual degree of promptitude. Special castings, such as valves for stoves, blowing engines, machinery, and high class fire-brick, are all pretty well engaged, and delay must ensue before such orders can be filled for additional furnaces. Beyond this, however, comes the greater difficulty of obtaining supplies of materials. The coal trade of the United States has been very active during the past winter, and has been pushed to the uttermost, and an increase in the coal production is always of relatively slow growth, considering the limited number of men that can be put to work in driving headings and entries. The same remark applies, of course, to the process of underground ore mining. In addition to this, the great ore region of Lake Superior was handicapped last mining season by an absolute scarcity of men. This was in part due to the great advance in the price of copper, inducing the owners of copper mines to press them to the highest measure of production and to pay higher wages, which drew away the miners from the iron mines to the copper mines. Payment of higher wages in turn by the iron ore mines might draw some of the labor back again or other labor to take its place. but the stocks of iron ore at the docks or lake ports have been reduced, and remnants cleaned up that have been on hand for years. and the indications are not favorable at present for available ore for any important increase in pig iron production during the year 1899. That every effort will be made to increase it goes without saying, but my view of the situation is supported by the editorial in *The Iron Trade Review* (Cleveland, O.) of March 16, which reached me this morning, in these words:—

It should be taken as a fundamental fact in calculations for the future that no early increase of any significance can be made in the pig iron producing capacity of the country, either in Bessemer, or non-Bessemer irons. Preparations that involve organizing forces to reopen old ore properties, as is being done in parts of New York. Pennsylvania, and Virginia, are not completed in a week or a month; and the repair of stacks, and procuring of equipment and supplies, mean a vast amount of detail. Later in the year something may be heard of these furnaces in the statement of pig iron production, but calculations that will exert any material influence on prices for 1899 may be disappointed.

It is not improper in this connection to take into account the necessity of getting together skilled forces both of workmen and of men as furnace foremen and managers. Existing plants, as a rule, are worked to their fullest capacity, and the increase that might be expected to come on earliest would be from the concerns now lying idle, and they, not being in active touch with the men and managers required, would have difficulty in getting together the necessary working staff. For these reasons I do not attach personally much importance to what is called the idle furnace capacity of this country, and that (furnace capacity) really governs the question of the production of finished iron and steel; for unless the mills can obtain the pig iron they cannot in turn increase their own output of bar iron, plates, sheets or billets. I am, therefore, led to believe that the present high prices of American iron and steel products will continue until affected by one or other of two causes, which ever may first happen:—

1. A cessation in the present enormous domestic demand as the result of (a) Some unforeseen political complication. (b) Any great labor disturbances, of which there are no signs at present.

2. Such an increase in the productive capacity of the active large concerns now in the forefront of the trade as will turn the balance and give a slight excess of production over consumption. Towards the accomplishment of this we have in sight the following new furnaces, which are backed by sufficient money, experience, and energy to bring them reasonably into sight within the present year:

Two at Duquesne, building by the Carnegie Steel Co. [This statement is in error. No furnaces are under construction at Duquesne, though it has been understood that ultimately two more furnaces would be added.—ED. *Iron Trade Review.*]

Two at Lorain. by Federal Steel Co.

Two at Youngstown by the Ohio Steel Co.

One at Pittsburg, by Jones & Laughlin.

In addition to these there are two of the Jones & Laughlins furnaces rebuilding on a larger scale, and the two Carrie furnaces being enlarged and rebuilt by the Carnegie Company. These changed and new furnaces together will increase the production at least 4,000 tons per day when they all come into operation, and this is a larger increase than the reduction in visible stocks for the past six months would offset. [Eliminating the two Carnegie furnaces mentioned reduces the 4 000 ton estimate below 3,000 tons. It is probable that none of the new furnaces, save those at Lorain, will be ready for operation in 1899.—ED.]

It would appear, therefore, that if the present consumption is continued without increase these new furnaces would turn the scale and create some little excess in the supply of pig iron, which in turn would be felt by the works for the production of finished material. It is, however, fair to consider that during the past 12 months there has really been a larger decrease in the stocks than has been apparent from the figures accessible to the public. In other words, lots of iron carried on furnace yards for their customers for which private receipts have been given, and blocks of iron carried by the owners on ground leased for the purpose, have all been cleaned up; stocks of iron also in consumers' own yards, which have been carried under special warehousing arrangements, have been used up; and to-day there is scarcely any iron in this country except that which appears on the regular monthly returns. Taking this into consideration, it may require the furnaces above quoted to balance the visible and invisible decreases of stock that have been taking place during the past year.

Summing up the whole situation, I can see nothing but some enormous, extreme, and unprecedented shock, from political or social causes, which can reasonably be expected to so interfere with the present relations of supply and demand as to cause any weakening in prices of iron and steel in this country during the present year.

Yours truly, J. BOWRON.

Received From the Trade.

The Ingersoll-Sergeant Drill Co., 26 Cortlandt st., New York, issues a pocket index of its air compressors, with clear half-tones of the principal types for railroad, mine, quarry, water works and general manufacturing service. They are steam or belt driven; compact and self-contained; simple or compound, with improved inter-coolers and water circulation around the cylinders and through the heads. There is automatic regulation of air pressure and speed. In the last four pages of the pamphlet is an enumeration of the various uses of compressed air, no less than 160 operations being specified, ranging from cold storage, copying presses, beating eggs and freezing quicksand to the driving of cranes, molding machines, pumps, reamers, fans and apparatus for breaking scrap iron.

THE Gaylord Iron Co.'s charcoal furnace at Detroit will be put in blast as soon as a supply of ores can be brought down from Lake Superior.

GEO. K. HOSFORD, Cleveland representative of Rogers, Brown & Co., has removed his office to 713 Perry-Payne Building.

THE IRON TRADE REVIEW
AND
INDUSTRIAL WORLD.

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APRIL 20, 1899.

THE PUBLIC AND INDUSTRIAL STOCKS.

It is recognized that the new industrial stocks must be hedged about with more safeguards, if they are to become a popular form of investment, and if staple stocks are to be insured against sudden collapses in values. With this in mind, the committee on stock list of the New York Stock Exchange has made several important amendments of the details required from industrial and manufacturing companies. The information that must be given under the new requirements is thus specified:

"Original applications to list any securities of industrial or manufacturing companies must be accompanied by a copy of the charter or act of incorporation; by-laws of the company; opinion of the counsel that the company has been legally organized and that the securities have been legally issued; statement whether this is an original organization or a consolidation of several previously existing firms or corporations; A full description of the property, real, personal, and leased; nature and character of product, and general statement of the business proposed to be transacted; opinion of the counsel that real estate owned is free and clear, except as to stated liens; report of responsible expert accountants, showing results of business each year for the period of at least two consecutive years if possible, and a balance sheet showing assets and liabilities of recent date; statement of special rights and privileges of directors, as conferred by charter or by-laws; and agreement that the company will publish at least once in each year a properly detailed statement of its income and expenditures for each preceding period, and also a balance sheet, giving a detailed and accurate statement of the condition of the company at the close of its fiscal year or of recent date. Applications to list additional amounts of such securities must give like additional information, together with statement of application of the proceeds of securities so issued."

The publication of annual statements is one step toward informing the investing public on matters which they are entitled to know, and will do something toward begetting a confidence that does not now exist. This much and more should be provided if there is to be any realization of the suggestion of Gov. Flower, referred to in these columns last week, that in time employes would become stockholders in the companies for whom they work, and thus an element be introduced that would help greatly to the solution of the labor problem. It is surprising to find so conservative a man as Abram S. Hewitt voicing like sentiments. In writing last week to the United States Industrial Commission, now in session at Washington, Mr. Hewitt said: "My own view is that when industry has been sufficiently centralized and the ownership widely diffused, through the distribution of shares, the workmen will gradually acquire the shares and control the property which they represent."

That is, on the assumption that the original holders or their successors, representing a control, are willing to part with such control. Unless the consolidations become losing rather than money-making investments, the men who have interested themselves in bringing many establishments into one, will not seek to diffuse the benefits of stockholding. Mr. Hewitt no doubt looks to the farther future, when the original holders shall have passed from the stage, while the big impersonal, soulless corporation pursues its onward course. But it is questionable if diffusion of ownership is to come even then. The history of the great railroad corporations shows a tendency more and more toward centralized control. There may be many stockholders; but concentration has gone so far that roads are as often called by the family name that stands for the controlling interest, as by their corporate name.

It is futile to make predictions concerning the outcome of all that has come upon the industrial and financial world like a flood in these past few months. Yet there must be agreement on this point: that the new consolidations must walk circumspectly if they are to have the public favor that alone can insure their permanence. If they consult their own interests they will court, rather than avoid, full publicity concerning their business and the value of their properties.

THE Japanese have of late years become larger consumers of our wire nails. Our factories on the Pacific coats have been kept busy making nails especially adapted to Japanese requirements. Only German manufacturers have competed for this trade, bat we have sold a hundred tons where the Germans have been able to sell one. The wire trust has, however, so advanced prices as to give the Germans a better chance, and the Japanese are considering the question of making their own nails from imported wire. No doubt the trust will in time be enabled to destroy the trade built up by our exporters.—[Philadelphia Record.

A large part of the exports to Japan have gone from wire nail mills in the Central West, which with most modern equipment and small cost per unit of output, due to their large tonnage, have been able to do a good business with the Orient. Temporarily the unprecedented home demand and the heavy shipments made to Japan in the fall of 1898, and timed to reach that country before the advnaced tariff took effect, may cause something of a slackening in exports; but it need not be expected that the wire and wire nail consolidation will deliberately kill off a trade built up by its constituent companies. That outlet is sure to be preserved, if home effort can do it, for our capacity to produce wire nails is much beyond our ordinary consumption.

Moreover a prime dependence of the new plant now going up at Ensley, Ala., is this self-same export trade, for the promoters of that enterprise have had experience enough in wire nail manufacture to know —and so announced at the outset — that there is no need of additional mills for the supply of the domestic trade.

Iron and steel exports have become so important a factor in the foreign trade exhibit that special attention is called to them in the statements given out by the Statistical Bureau of the Treasury Department. The following exhibit of iron and steel imports and exports in the eight-month periods ending with February, in 1897, 1898 and 1899, shows at a glance how great has been the gain in the outward movement and how the imports have been steadily reduced:

	Imports.	Exports.
1897	$10,517,588	$35,781,809
1898	8,397,977	42,864,262
1899	7,564,958	58,377,784

Exports of wire nails in eight months of the fiscal year 1898 were 16,138,325 pounds; in eight months of 1899, 28,697,735 pounds. Exports of bars or rods of steel increased from 18,720,798 pounds to 37,708,442 pounds; steel plates and sheets, from 13,523,675 pounds to 64,784,626 pounds, and wire from 80,056,290 pounds to 126,858,949 pounds.

The revival of puddling that has taken place recently, particularly in Ohio and Pennsylavnia, will make the puddling rate a question of live interest at the coming convention of the Amalgameted Association. It may be expected that adjustment will be easy, however, since present prices of bar iron, which are likely to last through the year, will bring the puddler's wages up to a basis that no doubt will be entirely satisfactory, even on the present base. The total number of puddling furnaces in the country, as reported for the American Iron and Steel Association's Directory last year, was 3,889, each double furnace counting as two. It is estimated by Amalgamated Association officials that practically all these furnaces are now in operation, giving employment to more than 8,000 puddlers, or more than twice as many as were thus employed one year ago.

The Metal Market.

The following quotations represent the market on metals Monday, April 17.

Copper.—Lake ingot, 18⅞c to 19c for early delivery; futures, 18½c to 18⅝, New York.

Tin —24.75c to 25c, New York, for spot; London, £113, 15s. for spot and £114 7s. 6d. for three months.

Spelter.—April and May, 6.50c to 6.60c, New York; London, £27, 17s. 6d; St. Louis, 6.30c.

Lead.—Spot to May, 4.32½c to 4.35c, New York; 4.12½c to 4.15c, St. Louis; £14, 10s. for soft Spanish lead, London.

The use of the name of I. W. Frank as manager in publications concerning the starting up of the Old Meadow Rolling Mill Co.'s plant at Scottdale, Pa., was an error. Mr. Frank is the president and general manager of the Frank-Kneeland Machine Co. and does not intend to hold any position with the sheet mill. His connection as a stockholder simply grew out of the contracts his company had taken for mill work at Scottdale.

FOUNDRYMEN'S CONVENTION AT PITTSBURG.

The 1899 convention of the American Foundrymen's Association, to be held in Pittsburg, May 16-19, Tuesday, Wednesday, Thursday and Friday, is the association's fourth. Philadelphia had the meeting of 1896, Detroit that of 1897, and Cincinnati the convention of last year. Naturally anticipations of the Pittsburg meeting are on no moderate scale, for the visitor lays plans for a visit to some of the famous plants that crowd the Monongahela Valley, and the other environs of the Steel City; and the preliminary announcement made by the local committee and by Secretary Penton, of the American Foundrymen's Association indicates that there will be no disappointment on this score. Nor will there be anything lacking that can contribute to the enjoyment of the guests, to judge from the outline of the entertainment committee's plans. Not only as a foundry center, but as a railroad meeting point Pittsburg promises to bring together a large representation of the association's membership; and the secretary and the local committee unite in inviting all foundrymen to attend and participate in the discussions and the excursions. Reduced railroad rates have been secured, as heretofore, and arrangements have been made for hotel accommodations on a reasonable basis. The Pittsburg committee that has been planning interesting features, both from the standpoint of recreation and enjoyment, as well as that of improvement in the foundry art and enlarged technical equipment, announces that it is not yet through planning, and that it is the intention to make this in all particulars a memorable convention. The program so far as perfected is outlined as follows:

Tuesday, May 16.

Morning.—Reception and registration of visitors. Opening of the convention with an address of welcome by Mayor W. J. Diehl. On behalf of the local foundrymen City Attorney Clarence Burleigh will speak. Mr. Burleigh's welcome will be doubly appreciated from the fact that he served a full apprenticeship at the molder's trade. The response will be given by President C. S. Bell, for the association. Reports of the president, secretary and treasurer, for the year, will follow and if there is time the first of the technical papers will be presented.

Afternoon.—Delegates and friends will be taken on a trolley ride about the city and shown its points of interest including Carnegie Library and Schenley Park.

Evening.—Two unusually interesting papers will be read, and illustrated by the aid of a stereopticon. They will embody an account of some of the recent improvements in foundry designing and erection and foundry equipment.

Wednesday, May 17.

Morning.—Reading of papers and transactions of the business of the association.

Afternoon.—A train will be taken and the members and friends carried to Wilmerding to the well-known works of the Westinghouse Air Brake Co. Its reputation for original labor-saving methods is country wide, and the operations that will be shown here will no doubt be in the nature of a surprise to many of the visitors. Some description of them has already appeared in these columns. Of special interest are the appliances for wetting and riddling the sand and conveying it to the floors and the molding machines; the conveying apparatus; the unique core room equipment, and the cupolas. Castings of difficult form are molded by machinery; green sand cores used in the casting of the cylinders of the air brake system are formed in a way peculiar to this establishment. The traveling platform on which molds are conveyed to the cupola, and on which after pouring the flasks are placed, to be carried to the shaking out point, will also be inspected. The entire plant is one of the most thoroughly up-to-date in the United States.

Evening.—An informal reception will be given the visitors at Hotel, and it need not be said that this will prove one of the most conspicuous social events of the association's convention history.

Thursday, May 18.

Morning.—Papers and business including election of officers this session probably concluding the formal meetings of the convention.

Afternoon.—An excursion will be made to the Homestead

Steel Works—a trip which it need not be said every delegate and guest will make a point of taking.

Evening.—An informal gathering which may be made a smoker.

FRIDAY, MAY 19.

Should all the business of the convention be disposed of before Friday, the last day will be given up to visits to foundries and other establishments in and about Pittsburg. Chairman I. W. Frank, of the local entertainment committee promises every facility for these trips of inspection. The committee will be assisted in its work by a committee of ladies, who are preparing a program that will pleasantly occupy all the ladies accompanying members and other delegates.

Foundry Exhibits.

Provision has been made by Dr. Richard Moldenke, chairman, for the proper display of all foundry appliances, products or supplies that may be brought to the convention for inspection. All who can contribute articles for this exhibition are asked to address Dr. Moldenke, in care of the McConway & Torley Co. Another exhibit is being arranged by Secretary Penton, who has imported a large display of ornamental pieces of cast iron—statuary, brackets, plates, plaques. Additions to this collection are invited from members of the association and others. One piece in Secretary Penton's collection comes from a small interior town in Russia and has been over five months on the way. It represents in statuary two Cossack horsemen with characteristic mounts and riding in their familiar style. The work upon this piece will beget something akin to admiration for the achievement of the molders of the Czar's country, whose metallurgical operations are rated so far inferior to our own. Foundrymen who have pieces which might take a place in this exhibit are asked to write the secretary, John A. Penton, at Detroit. All exhibits sent to the convention will be carefully repacked and shipped back to their owners.

A complete program of papers and other features of the convention will be mailed to members by May 1.

AUTOMATIC CASK AND FREIGHT ELEVATOR.

An illustration is given of the Jeffrey Mfg. Co.'s automatic cask and freight elevator, designed for handling barrels, hogsheads, large and small boxes and other miscellaneous freight. The machine in question was installed at the warehose of the Southern Railway at Lynchburg, Va., to handle hogsheads of tobacco. It has been in operation for some time and the results have demonstrated its convenience and economy. The elevator consists of two endless chains running over sprocket wheels of special design at the top and bottom, the chain being provided with special attachments, carrying swinging finger trays. The elevator can be used for lowering as well as elevating and will load and unload at any floor. Hatchway fingers are provided at the different floors, which are set to register with the fingers of the trays. The mode of operation is as follows: When the machine is to be used for elevating, the casks or boxes are placed on the loading fingers below and the trays coming up between lift them off, elevate, carry them over the head wheels and down on the other side, depositing them upon discharging fingers. The trays pass away from under the load, going down and coming up on the other side for the next load.

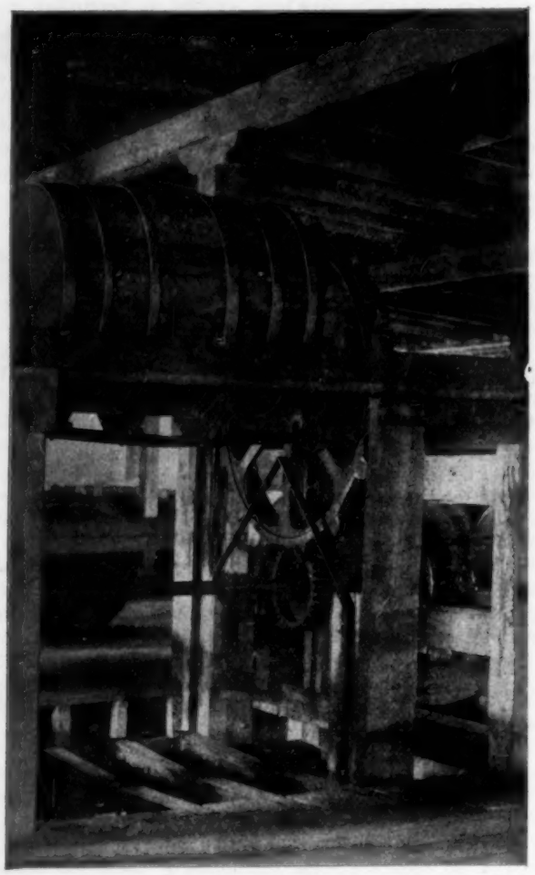


FIG. 1.

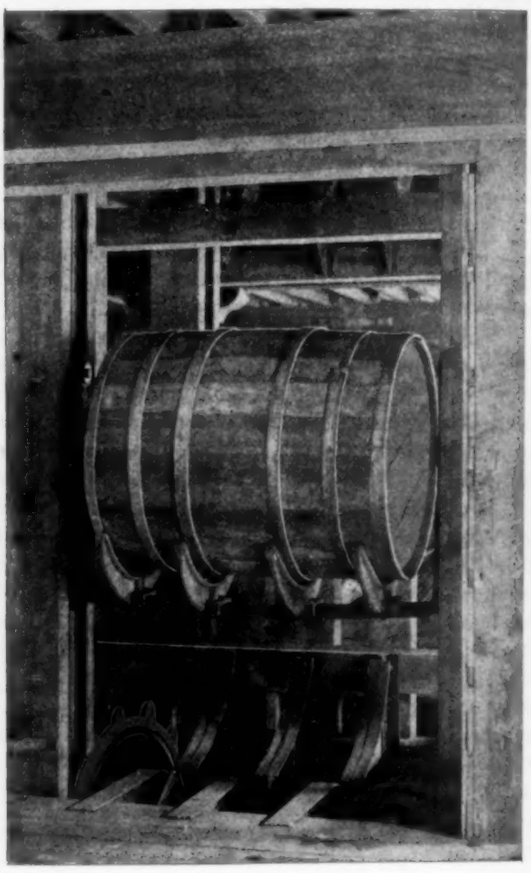


FIG. 2.

Fig. 1 shows the tray with a large hogshead of tobacco just as it is passing over the upper wheels ready to descend on the opposite side for discharging. Fig. 2 shows the foot of the elevator with the tray coming down with its load to discharge it on the delivery fingers, one-half of which are curved so the barrel will roll away from the hatch-way automatically.

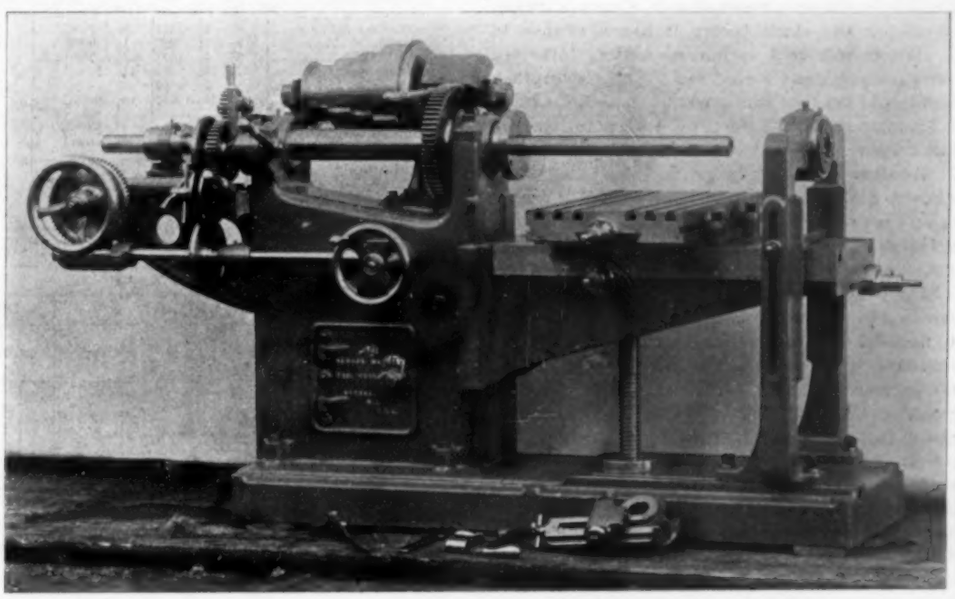
For lowering the load, the operation of the elevator is reversed. This can be accomplished by having a reversing link attached to the engine or running straight and crossed belts over triple pulleys. The tray coming up between the loading fingers on the upper floor, the load is lifted off, elevated over the head and down on the other side, and deposited upon discharging fingers on any floor desired.

This machine is made in different sizes and capacities for handling small packages weighing five pounds or less, and large ones weighing from 2,0000 to 3,000 pounds or more. The installation was made by the Jeffrey Manufacturing Co., of Columbus, O., which builds elevators and conveyors for various duties.

HORIZONTAL BORING AND DRILLING MACHINE.

In a previous issue an illustration was given of a horizontal boring and milling machine, designed by the Newark Machine Tool Works, Newark, N J. The machine shown below is the horizontal boring and drilling machine of the same company. Its features are the ease with which the work can be accurately set, the quick handling of the boring bar, and the concentration of the power upon the cutting tool. The work is bolted to the carriage, directly under the boring bar, being set square by the top surface and the edges of the carriage, which are true with regard to the bar. The carriage can be moved either across or along the table. The table can be lowered or raised from the side. With these movements of the table and carriage, using no blocking, the work is set quickly and with accuracy, for the all the surfaces and motions are true with regard to the bar. A strong yoke braces the table and steadies the bar. The boring bar is fed by a rack and pinion, and it is held by a friction clamp, so that, by easing the clamp and taking another grip, a long feed can be obtained. The feed motion is positive and powerful. The bar can be fed by hand, also, with either a quick or slow motion.

This machine has a 2⅜-inch bar and will bore and drill holes 10 inches in diameter and smaller accurately and rapidly. The table shown is 3 feet 6 inches long, which is the size most in use; but longer tables can be furnished.



HORIZONTAL BORING AND DRILLING MACHINE.

The bar feed at one setting is 18 inches. The driving motion is the Binsse patent, the advantages of which are that there is nothing in the way of the belts, all the speeds can be used with none too fast to be available, the change from quick to slow is made by a motion of a handle, and since the gearing is double and triple there is ample power. The carriage is 30 inches by 18 inches, with a possible cross feed of about 15 inches. The power bar feeds range from 1-80 to ¼ inch. By this device the feed can be changed, thrown in or out, or reversed, without stopping or reversing the driving motion.

The Philadelphia Exposition.

Preparations are going forward rapidly for the Philadelphia Exposition of 1899, to be held in September, October and November. Its aims are the development of American manufactures and the expansion of the export trade, and it will be the first national exposition of that character held in the country. It is the purpose to exhibit every line of manufactured products of the United States especially suitable for export. There will also be a department of foreign manufactured goods, but it will not contain a single exhibit shown by a foreign manufacturer. This department will consist of collections of samples of goods made in the commercial countries of Europe and successfully sold in all foreign markets in competition with American goods. These will indicate to American manufacturers just what foreign competition they will have to meet.

In October a commercial congress will be held in Philadelphia in connection with the meeting of the International Advisory Board of the Philadelphia Commercial Museum. A large number of representatives of foreign firms will attend, and delegates are expected from all the leading chambers of commerce of the country.

The exposition is to be under the auspices of the Philadelphia Commercial Museum and the Franklin Institute. The appropriations by Congress, the city of Philadelphia, the state of Pennsylvania, and individual subscriptions in Philadelphia, give a fund of about $900,000. The main buildings which are now under construction, cover eight acres of ground, and the available exhibition space will be at least 200,000 square feet. Outside of the space occupied by the main buildings there will be within the Exposition grounds, which comprise a tract of 56 acres of land on the bank of the Schuylkill river, within 15 minutes' ride of the City Hall, ample space for the erection of detached structures for special exhibits.

COMMISSIONER GENERAL PECK and B. D. Woodward, assistant commissioner general, sailed for Paris last week to further arrangements for United States exhibits at the Exposition. At the New York office of the United States commission, Frederick Brackett, secretary, it is stated that all who desire to exhibit in the Paris Exposition should immediately notify that office, or the Chicago office, in order that they may be considered in the allotment of space which will soon be made. There are many applications on file in every line of industry, but it is desirable that the American sections be not only representative of this country but also represent the largest possible number of producers. It is estimated that fully 60,000,000 people will attend, and it will be an opportunity to increase our foreign trade and to demonstrate that the United States is supreme in the arts of peace.

BUSINESS is growing in the Conemaugh valley. The Cambria Steel Co. is increasing its plant and its employes at present are working overtime. The mines are also showing great activity and at South Fork all the coal companies are doing a record-breaking business.

IT is reported that the Colbert Furnace Co., lessee of the Hattie Ensley Furnace, Sheffield, Ala., will expend $25,000 in repairing the furnace preparatory to putting it in blast.

THE E. & G. Brooke Iron Co., at Birdsboro, Pa., advanced wages 10 per cent on April 15.

ADVANTAGES OF WETTING COAL.

The practice of wetting soft or bituminous coal seems to be favored by some engineers and firemen, while it is condemned by others. This being true, it looks like a case where doctors disagree; and then who shall decide? There are two classes of men whose opinions are worth but little in such cases, and one class is of those who are always trying to find the easiest way to do whatever falls to their lot, and the other is those who have got into the habit of doing certain things in certain ways, without being able to give any reason for their practice. I do not mean to say that the hardest way is always the best, nor yet that the easiest way will not secure good results, but I do protest against the practice of allowing the necessity of putting forth a little more energy to prevent a man from doing satisfactory and economical work. Now it is much more work to handle soft coal that is saturated with water than it is to shovel in dry coal, and perhaps this fact may influence some men about deciding which gives the best results. The purely scientific and theoretical man asserts that there is no economy in wetting the coal because the water is decomposed and it requires as much heat to do this as we get back by the reunion of the gases which we call combustion. Furthermore, it is impossible for a direct loss to occur on account of the process, as it is almost impossible for changes of any kind to be made without some loss. Still, we find that the locomotive fireman almost invariably wets his coal, for, unless he does so, much of it is drawn through the tubes and out into the stack before it has a chance to burn at all. Where soft coal is burned under stationary boilers, the fires are frequently forced much more than they could be unless forced draught was used, and here it pays to wet the coal, for it prevents the soot from accumulating in the tubes, thus keeping the heat from acting directly on the iron or steel. Another reason why it pays to wet the coal is because it cokes up quicker, and although this makes it necessary to break up the fire at short intervals, still, if the coal is formed into large masses, it will not fall through the grates, as the fine particles always do when stirred up When the experiment of throwing a shovelful of fine, dry, soft coal into a furnace where a brisk fire is burning is tried, it shows that it flashes into flame at once, hence the heat becomes greater in a place where it is great enough already, so that the best results are not secured; but with wet coal, the process of combining the gases or of producing combustion is retarded until they have passed further along on their journey to the stack, where the heat can be applied to better advantage, and hence more satisfactory results secured. The vapor so formed probably assists in promoting combustion, for those who have tried both the blower and the steam jet affirm that while the clinker formed by the former is hard and not so easily broken up, that formed where the latter is in use is much softer and more easily broken, so that it will fall through the shaking grates. —[W. H. Wakeman, in the American Machinist.

THERE has been some difficulty with the men in the butt weld department of the Pennsylvania Tube Co., Pittsburg, over the advance in wages, which the men in this department claim was below what was promised, and there has been a break in the gas main which caused serious inconvenience last week.

THE Riter-Conley Mfg. Co., Pittsburg, has an order for penstocks or feeder pipes for the Great Northern Paper Co., to be erected at Boston, outside the paper combine. There will be five feeder pipes, 11 feet in diameter and 1,500 feet long, requiring about 3 000 tons of half inch plates. The pipes will be riveted.

THE great Sierra De Mercedi Mountain of iron near Durango, Mex., has been purchased by C. P. Huntington, a dispatch says. The purchase price is placd at $800,000.

THE W. B. Pollock Co., of Youngstown, O., has a contract for a large steel stack for the Nicholas Chemical Co.'s Laurel Hill works in New York. The stack will be 25 feet in diameter at the base and 335 feet from base of foundation to the top.

CONDITION OF BLAST FURNACES OF U. S.*

April 1, 1899.

Location of Furnaces.	Coke and Anthracite.					Charcoal.				
		In Blast.		Out of Blast.			In Blast.		Out of Blast.	
	Total No. of Stacks.	Number.	Weekly capacity.	Number.	Weekly capacity.	Total No. of Stacks.	Number.	Weekly capacity.	Number.	Weekly capacity.
New York	11	3	4092	8	6164	2	2	190	0	0
New Jersey	2	2	1672	0	0	.....	.....	.....	.....	.....
Spiegel	3	3	501	0	0	.....	.....	.....	.....	.....
Pennsylvania:						13	1	60	12	610
Lehigh Valley	26	12	6950	14	5085	.....	.....	.....	.....	.....
Spiegel	1	0	0	1	90	.....	.....	.....	.....	.....
Schuylkill Valley	11	6	4438	5	3647	.....	.....	.....	.....	.....
Upper Susqu. Val.	4	3	3221	1	600	.....	.....	.....	.....	.....
Lower Susqu. Val.	10	4	4447	6	2221	.....	.....	.....	.....	.....
Lebanon Valley	11	10	7541	1	534	.....	.....	.....	.....	.....
Spiegel	1	1	445	0	0	.....	.....	.....	.....	.....
Pittsburgh	30	27	61726	3	2045	.....	.....	.....	.....	.....
Spiegel	2	2	1031	0	0	.....	.....	.....	.....	.....
Shenango Valley	15	11	17185	4	4429	.....	.....	.....	.....	.....
Western Pennsylvania	20	10	12990	10	5280	.....	.....	.....	.....	.....
Spiegel	1	1	863	0	0	.....	.....	.....	.....	.....
Maryland	5	3	5770	2	1950	4	0	0	4	569
Wheeling District	9	8	11623	1	1080	.....	.....	.....	.....	.....
Ohio:						7	2	190	5	300
Mahoning Valley	13	10	16801	3	3255	.....	.....	.....	.....	.....
Central & Northern	9	7	11058	2	1940	.....	.....	.....	.....	.....
Hocking Valley	2	1	340	1	550	.....	.....	.....	.....	.....
Hanging Rock	12	6	2601	6	1432	.....	.....	.....	.....	.....
Illinois	16	14	27329	2	1750	.....	.....	.....	.....	.....
Spiegel	1	1	800	0	0	.....	.....	.....	.....	.....
Minnesota	1	0	0	1	629	.....	.....	.....	.....	.....
Wisconsin	4	3	2312	1	700	.....	.....	.....	.....	.....
Missouri	2	1	950	1	600	.....	.....	.....	.....	.....
Colorado	3	2	1575	1	700	.....	.....	.....	.....	.....
Virginia	22	9	6233	13	7900	4	0	0	4	437
Kentucky	5	4	2707	1	375	3	0	0	3	200
Alabama	30	18	19287	12	9100	12	2	618	10	2253
Mich., Mo. and Wis.	.....	.....	.....	.....	.....	18	7	3264	11	4190
Tennessee	13	6	4471	7	3890	9	1	280	8	2340
Georgia	2	0	0	2	960	3	0	0	3	670
North Carolina	2	0	0	2	600	.....	.....	.....	.....	.....
New England	.....	.....	.....	.....	.....	11	2	175	9	850
Texas	.....	.....	.....	.....	.....	4	0	0	4	875
Utah	.....	.....	.....	.....	.....	1	0	0	1	175
Oregon	.....	.....	.....	.....	.....	1	0	0	1	275
Totals	299	188	240969	111	67406	92	17	4777	75	13641

SUMMARY.

Fuel.	In Blast. Number.			In Blast. Weekly Capacity.			Out of Blast. Number.		Out of Blast. Weekly Capacity.	
		Month Previous.	Year Previous.		Month Previous.	Year Previous.		Month Previous.		Month Previous.
Charcoal	17	16	16	4.777	4,339	5.716	75	76	13,641	14,119
Coke and Anthracite	188	175	178	240 969	223,865	227,623	111	129	67,406	85,725
Total	205	191	194	245,746	228,195	233 339	186	205	81,047	99,844

*Condensed from the *Iron Age*.

AT one time bronze and brass were regarded as the best material for machine boxes, but in the last twenty-five years, especially, mechanical engineers have recognized the value of softer anti-friction metals. This is because they maintain a comparatively low temperature under high speed, retain the oil to good advantage, and can be easily handled. Isaac Babbitt, an Englishman by birth and a Yankee in everything else, was among the pioneers in the use of a soft alloy. His name has associated itself with all kinds of anti-frictional metals, although the formula now known as "Genuine" is the only one he originated. The Empire Metal Co , of Syracuse, N. Y., have sought in the past twenty years, to adapt the metal to requirements. They have made it an exclusive study, and when they know the conditions to be met, they make appropriate recommendations to manufacturers of machinery. The company makes many grades of metal, giving the alloy calculated to give the best results in the service specified.

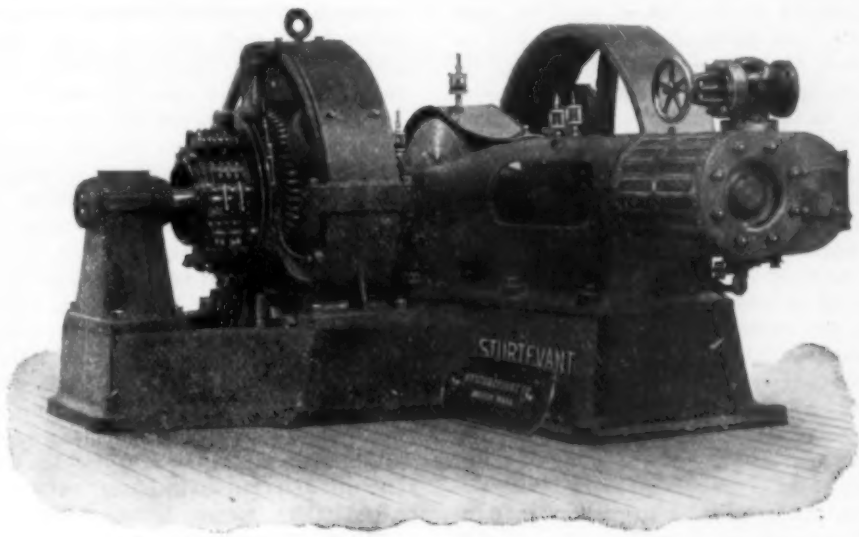
THE LaBelle Iron Works Co. has placed new boilers, rolls, smoke stack and roofs on the old Jefferson rolling mill, at Steubenville, O. It will employ about 100 men.

LAWRENCE Furnace, near Ironton, O., which was compelled to blow out in February, on account of an accident, started up again April 1.

GENERATING SET AND HORIZONTAL ENGINE.

The center crank type of horizontal engine has become much more popular since the advent of the type of generating set of which it so readily forms a component part. The form of set illustrated herewith is one of several types, designed and manufactured by the B. F. Sturtevant Co., of Boston. The engine was designed primarily for dynamo driving, and in every particular attention was given to those features necessary to successful operation under such conditions. The engine and generator rest upon a common cast iron bed. The engine itself is of such design as to enclose in part the running parts. The oil guard and the removable side plates serve still farther to render it of the enclosed type, and to this extent prevent the entrance of dust and the throwing of oil.

The valve which is of the balanced piston type, is provided with snap rings, and operates in a removable bushing, thereby making it a simple matter to always keep it tight. The regulator is capable of the closest possible regulation. It operates through a range of zero to three-quarter cut off. The engine cylinder is thoroughly lagged. All moving parts are adjustable, and continuous sight feed oiling arrangements are provided throughout. The armature is mounted upon an extension of the engine shaft, which is supported at its outer end by an independent pedestal with ring oiler. This generator is of the multipolar type, the field ring and cores being of cast steel, and the pole shoes of cast iron.



GENERATING SET AND HORIZONTAL ENGINE.

The proportioning of the magnetic field and armature is such as to insure absolutely sparkless operation under all changes of load from no load to 25 per cent overload. The temperature rise after a full load run of 10 hours is limited to 90 degrees F.

The armature is of the barrel wound type. A cast iron flange bolted to the armature spider at each end of the core, forms a support as well as acylindrical receptacle for the projecting ends of the coils. The flange extension also protects the windings from any oil that may be thrown from the windings. The surface of the interior of this flange is perfectly smooth, offering no opportunity for the collection of oil or dust. Ventilation is effected by the use of specially constructed veins, forming ducts between the laminæ of the core. These convert the armature into a blower, and creates a strong draft through the windings.

The series winding of the field coils consists of flat copper ribbon, the shunt winding being of wire. Both windings are placed on the pole entirely independent of each other, and either may be readily removed. Both shunt and series windings have free circulation of air upon all sides.

The type of set here illustrated is built in sizes from 6x6 engine to 16x14 engine, with output ratings of from 15 to 75 K. W. and weights from 6,000 to 23,000 pounds. The engine frames are arranged so as to be fitted with cylinders of a minimum of 80 pounds, or a maximum of 120 pounds pressure.

HARDENING A LARGE DIE BLOCK

BY A. PREGUNTA.

Being anxious to see a large die block hardened, I made arrangements with Mr. F. P. Bates, president of the Indianapolis Drop Forging Co., of Indianapolis, Ind., for that purpose.

I reached the factory about 8.30 A. M., and found they had ready a die block 10½ x 10½ x 6 inches, of Crescent Extra steel. A fire of pounded coke had been prepared on one of their forges, which had a hearth about three feet by four feet. A pair of large tongs, which would reach over and under the die, were made tight on it by the usual method of dropping a ring over the handles. Then passing a bar of steel about five feet long between the die and the tongs, just under the bolt that acts as a fulcrum for the tongs, and one man taking hold of each end of the bar, the die could be readily lifted, the tongs of course being removed as the occasion required.

There being plenty of coke on the forge, and the fire well under way, a flat place was prepared for the die. At 8.45 A. M. the die was placed in position in the fire, face down. Coke was piled up around the four sides so as to have the heat strike back from the face, about two inches, leaving four inches of the thickness not to be heated to any marked extent. A gentle blast was then turned on. At 9 A. M. the die was taken off and did not show any color from the heat. Fresh fuel was added to the bed and the die quickly replaced. At 9.15 it was again removed, the fuel replenished, and the die replaced. The same thing was done at 9.35 A. M., and the die showed some color on face and edges. At 9.50 more fuel was added, and the increase in color in the die could be noted. At 10.12 the die was raised up for examination; the heat was coming up to a dull red color, but uneven. At 10.21 it was raised up clear, turned around, and put back. The blast was made a little stronger, and the die pushed around from side to side, as heat was to be added to some particular spot.

At 10.26 it was taken from fire, showing a dull red color (except side next back of forge, which was a little higher), and extended about one inch back from face (on depth or thickness). The face wiped off with a piece of cloth handled deftly, and then, using tongs and steel bar, it was hung in the water tank, but a few feet away, so that about four inches of the face was in the water.

The water tank was about three feet wide, four feet long and three feet deep, and was fed by city water, the supply pipe placed in the bottom, so that it threw a stream directly on the face of the die. An overflow pipe carried away the surplus water. The bath was agitated by a man with a shovel, so as to insure fresh water striking the edges, and for the purpose of making a wide variation in the water level

At 10.30 it was dropped to the bottom of tank, face up; at 10.37 the city water was turned off; at 10.47 die was taken out of bath; at 10.54 the corners were drawn to a straw on the open fire, and at 11 A. M. it was again under water, finished except the polishing. The total time consumed was two hours and fifteen minutes.—[Sparks from the Crescent Anvil.

PNEUMATIC EQUIPMENT FOR BOILER SHOPS.

BY E. A. RIX.

It is not enough that a modern boiler shop should be equipped with a power punch, shears and rolls, which have until recently seemed to constitute enough of an equipment to satisfy the ordinary boiler builder that he is doing justice to his business, his customers and to himself. While these machines are labor savers of the first order, the proportion of work which they contribute in the manufacture of a boiler is small in comparison to the balance.

To overlook any opportunity to cheapen the production of standard commodities is a positive step towards a business failure, and a number of apparently insignificant savings amount to perhaps just enough to keep the business afloat.

To depend upon the sentiment of the consumer for a higher priced home product, is folly, for when the home consumer recognizes the fact that the local manufacturer does not take advantage of recent appliances for cheapening the cost of production, he does them an injustice which they repay by trading elsewhere.

In return for the patronage of a community a manufacturer, in order to establish himself on firm ground, must never permit his patrons to pay out their money for the loss of time entailed by the use of antiquated or inadequate tools or machines.

The pneumatic chipping, calking and light riveting tools, probably broke the ice as it were of the old methods, and took boiler making methods out of the realm of main strength and awkwardness and placed it alongside of machine shop practice. Plate steel may now be machined into boilers as legitimately as cast steel may be machined into engines. The pneumatic hammers have been a great help to boiler makers. In actual test, an operator with the pneumatic hammer cut off a 2½-inch tube in 36 seconds as against 2½ minutes by hand, and 46 tubes were cut off, turned over and beaded with the same tool, in an hour and three-quarters as against five hours doing the same work in the ordinary manner.

Horizontal boiler seams may be calked and trimmed in one-third of the time required by hand labor, and another great advantage is, that in using the pneumatic tool the quality of the blow is the same, consequently the calking should be perfect; whereas in hand calking, unless done by a very skilled mechanic, the quality of the blows varies considerably. The calking is therefore not homogeneous, the heavier blows tending to reduce the effectiveness of the calking done in a lighter manner.

For re-calking an old boiler or re-calking seams that have been imperfectly done, the pneumatic hammer is a most advantageous tool. A fresh cut can be made on the sheet in a very short time and in a perfect manner, and the boiler be re-calked with the tool so as to leave the seam in as good shape as if it had been recently manufactured.

It is only necessary to watch the operation of one of these tools in chipping cast iron, in cutting off heavy angles and beams or plates in awkward places and positions, to realize what a labor-saving device it is. There are many places where chipping and calking have to be done where it is almost impossible to swing a hammer or to properly guide a chisel or calking tool. Here is where the pneumatic tool shows to its greatest advantage. It weighs but a few pounds and does not occupy a space more than 12 inches long, and any place into which the arm can be thrust this tool can be pushed and good work be performed.

These tools are especially valuable in light riveting. Not only do they save a great deal of time in ordinary open riveting but in riveting up pipe they prove themselves money makers on every occasion. It is an expensive proposition to lay pipe and rivet up the joints in the ordinary manner. Holes have to be provided for passing into the pipe the hot rivets, which have to be pushed up through the holes and the men have to hold against the riveting from the outside. During all this operation light rivets are becoming cold and the difficulty and annoyance and hard work during the whole task make it expensive and the results inferior to riveting under ordinary conditions. With the pneumatic tool the rivets can be pushed in from the outside; the workmen on the inside of the pipe using the pneumatic tool to rivet it up on the inside. The holding is done on the outside. The workman inside is furnished with good air to breathe and merely has to handle the light tool. No expensive digging out under the pipe has to be undertaken in order to rivet the seams next the ground. In short, it is entirely probable that riveting in this manner can be done for at least one-third the cost and in a very much better manner than by hand.

The riveting up of gasometer rivets, stand pipes and tanks, which are set up outside, can be done much better and in a great deal less time by the use of these labor-saving devices.

These pneumatic hammers are not the only pneumatic tools which are used in modern boiler shops. There are many other appliances; for instance, pneumatic drill and tap combined, for drilling and tapping out the numerous holes required to be made for the stay bolts of fire boxes.

There is also the pneumatic drill, for drilling holes using ordinary twist drills. These machines are extremely easy to handle and they do good work.

There are pneumatic machines also for expanding tubes into place.

Every good boiler shop should also have, in addition to a large pneumatic crane, small pneumatic lifts for handling heads and sheets and pieces of boilers so they can be rapidly placed in position and without the pulling and hauling which would be necessitated by hand labor. A pneumatic crane properly installed in a boiler shop is a valuable acquisiton and should be made powerful enough to pick up an ordinary boiler and move it from place to place as required, or for final transportation. The entire surface of the shop in this manner would be made to yield working space, while with no means of lifting and transporting boilers over each other a large portion of the ordinary shop space has to be left open for gang way, and the annoyance and inconvenience of pushing boilers past each other for exit, and the moving of work and tools which are frequently in the way, causes a loss of time and annoyance which amounts to considerable.

In the testing of boilers much time and expense could be saved by having a water tank on the shop floor or in any convenient place, at sufficient height to readily fill any of the boilers for testing. After testing, the water may be expelled from the boiler by compressed air, which will shoot the water back into the tank in a very small fraction of the time necessary to empty a boiler under ordinary circumstances; in fact, emptying a boiler after testing is one of the slow jobs and generally loses a day in shipment, whereas, with the use of compressed air, after a boiler has been tested it can be emptied and shipped inside of an hour. The water is also saved, which in many localities is a considerable item.

Besides the pneumatic tools, a well equipped boiler shop should have a gang shell driller, for drilling holes in the shell, as required for government boilers, and if the shop is of any considerable size, a head spinning machine and furnace would pay for itself in a short time. The ease and rapidity with which ordinary boiler heads can be spun into shape and the certainty of turning out a first-class job, and the economy with which it can be done, should make it a desirable adjunct for any first-class boiler shop. All reasonable sized scraps about the shop can be heated in the same furnace, and with the addition to the plant of two or three forms of inexpensive hydraulic presses, these scraps could be made into manhole crow feet, manhole plates themselves, compressed steel or iron flanges, eyes, angle plates and many other pieces which go to furnish up a first-class boiler, which in cheap work are generally made out of cast iron. All this work, which consists of scarcely more than operating a lever connected to a machine and putting the heated raw material in place, can be done by boys as well as by the most experienced men.

For a large boiler shop the equipment would be incomplete without proper pneumatic or hydraulic riveters for heavy work, and finally when boilers are finished they can be painted more effectively and in one-third the usual time by the use of pneumatic spray painting machines which are now in use amongst most of the large car shops in America.

A compressed air plant to do all this work for an ordinary shop would be a very small one. A 15 h. p. engine, driving a small compressor, could with sufficient receiver capacity handle all the business of an ordinary shop, unless the boiler

testing was done with compressed air, which by the way is, to the mind of the writer, a better method than cold water, for with the use of soap, water and a brush to paint the seams, the smallest leak can be instantly detected by the bubbles blown, and the rapidity with which the pressure can be introduced and released and the absence of water and leakage, makes the whole operation more desirable.

A valuable addition to any boiler shop would be a portable pneumatic plant with the proper tools for doing work away from the shop, such as erecting gasometers, stand pipes, putting in riveted water mains and doing any sheet iron work where the use of these tools saves in both expense and time. These plants could be small and easily portable and would certainly pay handsomely to the shop that possessed them.

The writer is glad to note that most of our principal shops here in San Francisco have, during the last twelve months, been gradually improving their equipments and installing many of the tools described above, with the most satisfactory results. Never has the output of boilers been so great in San Francisco as during the past six or eight months. While our manufacturers here are handicapped by a limited field and therefore not enjoying the advantages of manufacturing considerable numbers at a time, still the differences between the freight on raw material and the finished product in this community, acts as a protective tariff which partially does away with the disadvantage above mentioned and our boiler makers feel that with modern tools and methods they can hold their own in the competition which is everywhere the life of trade. —[The Boiler Maker.

STEVENS WATER-TUBE BOILER.

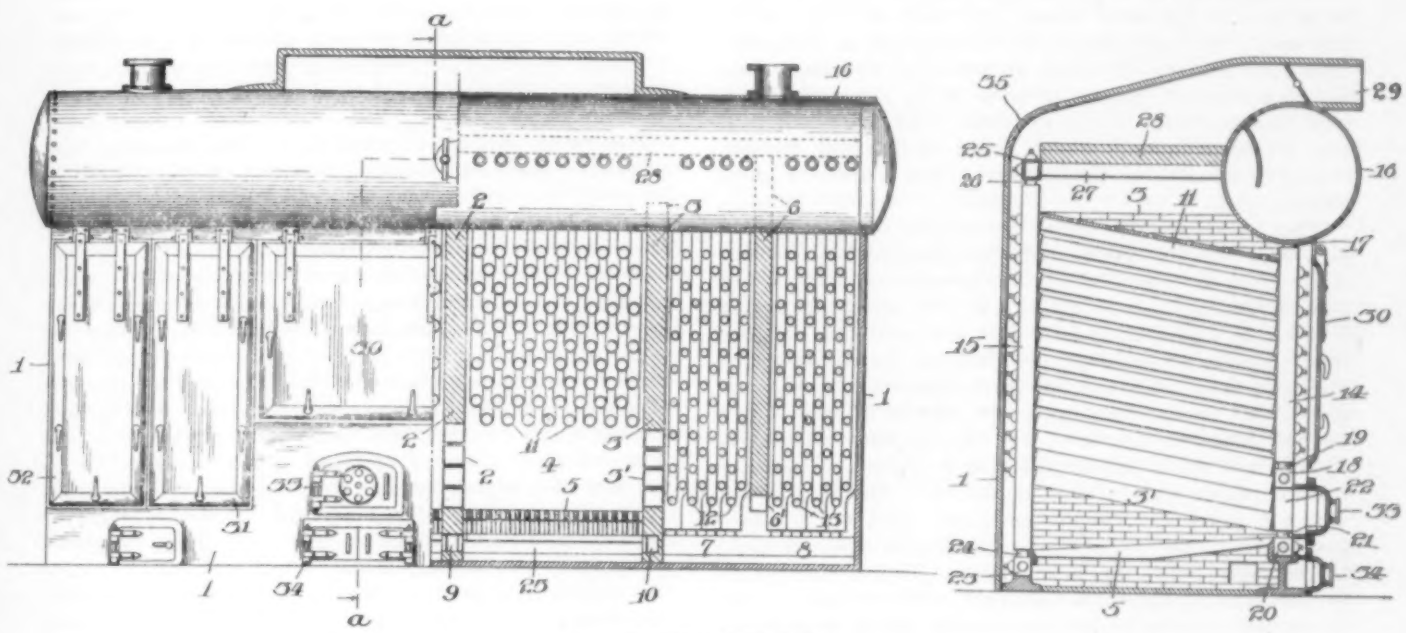
A number of patents have been granted recently to John A. Stevens, of Lowell, Mass., modifying and improving his previous inventions of water tube boilers in which means are provided for directing the products of combustion transversely to the courses of water-circulating system and into active contact with it. In the improved boiler, of which a front elevation partly in section is given in Fig. 1, and a vertical sectional view in Fig. 2, the inventor has provided a construction designed to save head room, strengthen the structure, make the various parts accessible and removable, facilitate circulation, and provide within relatively small space a large heating surface for the generation of steam. The main features are a primary and a secondary pass separated by a baffle wall; a bank of inclined tubes in each pass, with their vertial planes parallel with the baffle wall. The steam and water drum as shown in Fig. 2 is placed above the front headers, and connected with them by nipples. The division and baffle walls are formed of a combination of refractory material with water boxes, the latter being placed in the lower parts of the passes where they can be removed readily.

In constructing the boiler the headers, which are shown in vertical positions, may be inclined when this is deemed expedient. The position of the drum above the headers for the lower ends of the tubes results in a material saving of head room and that this arrangement, with the employment of the horizontal water boxes, which connect the corresponding headers for the several passes, materially stiffens the water-circulating and steam-generating system, renders it more compact, more readily assembled and dismembered, and facilitates free circulation. When the capacity required is small, the same general arrangement may be embodied in a construction employing a single primary pass or combustion-chamber and the corresponding secondary passes, omitting one-half of the double construction shown.

In operation the products of combustion pass from the primary combustion-chamber 4 through the apertures between the bridge walls or baffles 3 and the roof baffle 28, thence downward through the passes 7 and beneath the baffle walls 6, thence upward through the passes 8 and above the roof-baffle 28 to the breeching 29. In the water-circulating and steam-generating system the course is downward from the drum through the headers and water-boxes connected beneath them, thence upward through the water tubes and boxes connecting the two headers, and from the second headers and water-box back to the drum through the tubes.

Fig. 1.

Fig. 2.



STEVENS WATER-TUBE BOILER.

Danielson Machine & Tool Co.

Reference has been made heretofore to the establishment of the above company in its ample quarters 83-87 Lake st., Cleveland. Its principal business will be the buying and selling of machine tools, as well as manufacturing special machinery, dies, and fine tools. It will also give special attention to experimental work, having facilities for carrying on this class of work in private rooms where inventors can make their experiments secretly. The company's machinery store room is well filled with a large assortment of E. W. Bliss & Co. presses, and such other machinery as that company manufactures; also a large assortment of machinery built by the Garvin Machine Co, of New York. The Danielson Machine & Tool Co. is authorized agent of both these companies for Cleveland and surrounding territory. In addition there is carried in stock a variety of other new and first-class second hand machinery. All second hand machinery sold is first thoroughly overhauled in a machine shop, so that in making sales of such goods, the company is in position to state definitely their condition. In addition to a well equipped machine shop, the company has a forge shop, and expects to do jobbing and special work.

THE Dunbar (Pa.) Furnace Co. advanced the wages of all employes 5 per cent on April 1, the second since Jan. 1. The men have asked for 15 per cent advance.

GAS ENGINES.

BY J. EMERSON DOWSON.

Gas engines were invented long ago, but it is only since Dr. Otto introduced his four-stroke cycle in 1876, that a real gas-engine trade has sprung up. The development in the last 23 years has been remarkable, and evidently the gas engine offers real practical advantages. Between 1877 and 1897 the Gas Motoren Fabrik of Deutz, and Messrs. Crossley Brothers in Great Britain and Ireland 30,973 sold Otto gas engines, of 333,062 B. H. P.; in Germany, 17,026 of 103,786 B. H. P.; and in other countries, 14,962, of 84,804 B. H. P.; total, 62,961, of 21,652 B. H. P. Last year Messrs. Crossley Brothers sold 2,971 engines, developing a total of 38,995 B. H. P. There are other makers of gas engines.

This progress is due to several reasons, the most important being the cardinal fact that the heat efficiency of a steam engine and boiler is not nearly as great, and cannot be so great as the efficiency of a gas engine and gas plant. Lord Armstrong in 1881, when discussing at the meeting of the British Association the efficiency of the steam engine and boiler, said that dividing the whole heat energy into ten equal parts, two escape by the chimney, one is lost by radiation and friction, six remain unused when the steam is discharged, and one only is realized in useful work. Professor Kennedy at the Royal Institution more recently (1893) asserted that while the theoretical maximum efficiency of the steam engine is only 30 per cent, actually only 5 to perhaps 15 per cent of the whole heat of the steam is ever turned into work. The gas engine, he showed had a maximum theoretical efficiency of about 80 per cent, and the actual energy utilized in a gas engine is 26 to 30 per cent of the total heat developed in the cylinder. Thus the theoretical heat efficiency as well as the actual efficiency of the gas engine are about three times greater than those of a good steam engine.

When a gas engine is driven by ordinary town gas made on a large scale for lighting and other purposes, it is difficult to apportion the loss of heat in the process of manufacture and distribution for a single engine; but where an engine is served by a gas plant which does not make gas for any other purpose, the latter may be taken as the equivalent of the steam boiler, and their relative efficiencies may be compared. Mr. Dowson then gave the records of tests which he had made to determine the relative heat efficienceis. From this it would appear that the combined efficiency of a steam engine and boiler is as follows:—Theoretical best, 25½ per cent; practical best, 10½ per cent; and practical average only 4 per cent. With a gas engine and gas plant the combined efficiency is as follows:—Theoretical best, 72 per cent; practical best, 24.6 per cent; and practical average, 15 per cent. It may be said that a boiler would work with a higher efficiency if the steam were at greater pressure, but as the temperature of the steam is raised so will the temperature of the chimney gases be raised also, and there will be greater loss from radiation. The gain, therefore, would not be important, but apart from this the limit of pressure is governed practically by considerations of construction and safety. Doubtless some improvement will still be made with superheated steam, but whatever is done it is hardly likely that with a boiler and engine the combined heat efficiency will ever exceed 15 per cent of the total heat energy of the fuel, or not much more than half the combined efficiency already obtained with a gas engine and gas plant.

The characteristic feature of the gas engine is that combustion takes place inside the cylinder and not in a separate boiler furnace as for steam power, and in the Otto engine the charge of gas and air is drawn in, compressed, and then fired, all in the same cylinder. Gas can be conveyed almost any distance without appreciable loss or deterioration; the ordinary gas pressure in pipes is equal to not more than 1 or 2 inches of water, and with reasonable care there need be no leaks. Moreover, if the gas is cooled on its way to the engine it is an advantage, as it is more dense, and a given volume contains a greater amount of energy. With steam, if the pressure in the pipes is only 50 to 80 pounds, it is much greater than that of the gas, and leaks are often troublesome; further than this, if the steam is cooled, there is loss from condensation, and in large works and shipyards this is serious; it often makes the consumption of fuel as much as 10 pounds per B. H. P. and more. Independently of these manifest advantages, when a gas engine is driven by town gas there is the great convenience of being able to start or stop the engine at a moment's notice. There is no boiler and no chimney, no clinkers and no ashes to remove, no fireman to pay, no loss of fuel, during the stand-by hours. These conditions are ideal, and have had much to do in popularizing gas engines; especially for small power, steam engines cannot compete economically with gas engines, even when worked with such a costly fuel as town gas.

As it was apparent that gas engines would sooner or later reach a point where ordinary town gas would cease to be economical, the author had therefore devised an apparatus to make cheaper gas, and this generator gas is now used exclusively for all the power required at Messrs. Crossley's works over 500 h. p. The engines sold by them to work with generator gas represent an aggregate of 42,283 h. p. while the total of engines made in this and other countries to work with generator gas cannot be less than 60,000 h. p. The successful introduction of a compact plant for making cheap fuel gas has contributed considerably to the development of gas power, especially with large engines. Under the usual conditions of regular working if an engine indicating about 20 h. p. is worked with town gas at 3s. per thousand cubic feet, it costs more than a steam engine of the same power, but with generator gas the cost is much less than with steam. Besides this, there are now many gas engines developing over 100 h. p., and a gas-generating plant has become almost as necessary to the larger-sized gas engine as a boiler is to the steam engine.

The four-stroke cycle patented by Dr. Otto has now been adopted by nearly all the leading makers of gas engines. While the patent was in force various modifications were tried, but as soon as the patent expired most of them were given up. At the same time even the original makers of these engines have made important modifications and improvements, while adhering to the cycle. The slide valves formerly used which gave so much trouble have been given up, and this has led to the compression of the charge of gas and air being much higher now than formerly. One effect of raising the compression is to insure quicker and more complete combustion of the gas, and to increase the difference between the initial and final pressure in the working stroke, and in this way to raise the heat efficiency of the engine. Compared with the early engines, the friction of the engine and the gas consumption per h. p. have been reduced 50 per cent. When the lower compression was in vogue it was difficult to secure prompt and regular ignition of the charge of generator gas and air. Now a system of scavenging out has been adopted in the best engines of large size. Scavenging has the advantage that it reduces the risk of the explosive mixture being fired prematurely. The hot residuals are displaced by air which also helps to cool the cylinder and piston, and pre-ignitions can be avoided. This of itself is an important improvement, and without it larger engines could not be worked safely.

Slow-running gas engines are not a success, and the tendency is to raise the speed rather than to lower it, especially for electrical work. Shorter intervals between the explosions naturally lessen the variations in speed; but apart from this a quick-running engine gives less time for heat to be wasted by conduction through the walls of the cylinders, though the gas engine has been greatly improved there is room for further progress, and it is only reasonable to expect that in the ordinary course of evolution it will be further modified and improved. Its great rival, the steam engine, has no such margin for improvement.

In describing a gas plant Mr. Dowson said it is not necessary to have a large holder, and a generator gas plant can work comfortably and well without occupying more ground space than is required by a horizontal boiler of about the same h. p. The rate at which the generator gas can be made, can be governed automatically to suit a varying rate of consumption. The repairs and maintenance of a gas plant are also less than for a steam boiler of the same power. For 100 indicated h. p. plant maintenance and repairs cost about £4 per annum; for 200 about £6; for 300 about £8; for 500

* Abstract of a paper read before the Cleveland Institute of Engineers, Middlesborough, Eng., March 27, 1899.

h. p. about £14. Roughly the cost of generator gas is 2d. to 3d. per 1,000 cubic feet delivered into the gas holder, including fuel, wages, and repairs. It is, however, necessary to use four volumes of this gas to obtain the same power as with one volume of ordinary town gas, so that the equivalent of 1,000 cubic feet of the latter costs 8d. to 1s. For engine work the best fuel to use is anthracite, and formerly it was necessary to use nuts and cobbles, but the arrangement of the grate has been altered so that small anthracite peas can be used, and these cost usually 6s. to 7s. per ton at the pit, or 5s. to 6s. less than nuts. The quality of the gas is much about the same with peas as with nuts, and with special care the peas can give higher results. Good coke, clean, and in small pieces can also be used, and there are some installations where no other fuel has been adopted, and where the results have been satisfactory. Unfortunately the quality of ordinary gas coke varies a good deal, partly owing to the nature of the coal from which it is derived, and partly to the retorts being worked at a comparatively low temperature. The effect is that some coke yields a troublesome amount of clinker, while there is a good deal of tar and sulphur. The author said he had long been experimenting with bituminous coal, and he expects shortly to be able to say that he has succeeded with it. The chief difficulty is that when this coal is put in a hot generator, condensible tarry vapours are given off which are exceedingly troublesome to deal with, and unless all tar is removed from the gas it clogs the valves, etc., of the engine. Some one sooner or later will devise a suitable plant for bituminous coal, but the difficulties are undoubtedly great to make it for 100 or 200 h. p.

In the discussion, T. Westgarth, of Middlesbrough, said that as a steam engineer he was disappointed with what he had heard. Mr. Dowson had stated that in his view the improvements in the steam engine had almost reached finality, and yet he showed that the steam engineer only got something like 4 per cent from the use of the heat. That statement he was inclined to doubt. The results with gas engines were very good, but the speaker could not see that the steam engine was so far behind. However, those connected with the manufacture of steam engines intended that the steam engine should go on progressing and be made very much more efficient than it was already. For small powers, and those that were used intermittently, he acknowledged that the gas engine was almost an ideal motor. He never recommended a steam engine under such circumstances. He did not, however, think that it was possible to have gas engines for large powers. Mr. Dowson had treated the steam engines unfairly, and had, apparently, been taking engines of 20 or 30 years ago and not the engines of the present day. He had taken the water used at 30 pounds per h. p. No doubt many engines used that and more, but it would be a poor steam engine that used that or half of it. He thought that Mr. Dowson must have been comparing the best gas engines with nearly the worst steam engines. There was a phase in the use of gas power which he would like Mr. Dowson to throw light upon, and that related to blast furnace gas as applied to gas engines. If that could be perfected it would be an immense advantage to the Cleveland district.

E. H. Craggs, of Messrs. R. Craggs & Son, shipbuilders, Middlesbrough, said his firm were perhaps the largest users of gas engines in the district. They did not use the gas from Mr. Dowson's or any similar plant, but were employing the town gas, of which they consumed over 8,000,000 feet per annum. They had some trouble with the town's gas; it was rather weak. That had not altogether been a disadvantage, as it had made them set to work to use it to the best advantage, and their experience was rather valuable. They had some difficulty in getting the engines started at times, but when they had got them started they were a splendid motor. They had not adopted a gas generating plant because they had no room. The cooling of the water had not proved an easy matter. He endorsed what Mr. Westgarth said about the water required for the steam engine.

R. J. Worth, engineer, Stockton, said he was a firm believer of the gas engine for high as well as low powers. He thought the table of heat efficiencies very much ran the steam engine down, however. He considered that the "practical best" heat efficiency with it as mentioned, 10.5 per cent, was a very long way below the fact—it was more like 17½ per cent than 10 per cent. There was one practical difficulty connected with the gas engine, and that was that the average engine fitter did not understand it, and any repairs had to be done by men from Manchester. That difficulty would, however, be removed as the gas engine came more into use, and the disadvantage would disappear.

Mr. Dowson, in reply, said in constructing his diagram of heat efficiencies he had used the figures of Professor Kennedy. With respect to the use of blast furnace gas for gas engines the first firm to employ it was Messrs. Cockerill, of Seraing. They had a 100 h. p. engine made in France, and erected at their works. From this they got very fair results, but not at first. Practically they used the first engine for the purpose of getting data for another, and now they have decided to become makers of gas engines which are to use blast furnace gases. At Wishaw, in Scotland, a 14 h. p. gas engine had been tried and gave fairly good results. The great difficulty with blast furnace gas was its low calorific power; there was a good deal of dust, and the gas had to be cleaned. The low calorific power was, however, the great difficulty. It was very difficult to get a quick ignition owing to the poorness of the gas, which was largely diluted with nitrogen. Cockerills had found out a way of working the gas engines.

PRICES of pig iron in England have risen considerably since the beginning of the year, and last week West Coast Bessemer brought $14.25 to $14.50; Scotch pig, $13 to $13.25, and Cleveland iron, $11.50 to $11.75. In Pittsburg last week Bessemer pig sold for $14.50, while No. 1 Alabama foundry brought $10.50 at furnace and gray forge $8.50. The latter prices were very much below the Pittsburg standard, No. 2 foundry selling there at $15.25, and mill iron at $14.50. Our prices of iron are now up to or above the English quotations. Exports are therefore impossible at present, and the shipments now going forward are on contracts made some time ago at lower prices. Indeed, we have not just now any surplus to sell abroad, though conditions will doubtless be changed in two or three months, when all the furnaces now being made ready come into blast and are producing pig iron. Our own quotations are, however, somewhat deceptive at the present time, as they apply only to a comparatively small amount of business, and a much larger quantity of pig iron is still being delivered under contracts made at much lower prices. These deliveries will run well up to July, and by that time a greater production may regulate prices.—[Engineering and Mining Journal.

THE *Railroad Gazette* reports the following new orders for equipment: The Cincinnati, Hamilton & Dayton has ordered 10 locomotives. The Choctaw, Oklahoma & Gulf 20; the Pennsylvania, 25, and will probably build 100 more; other roads 21. The Great Northern Ry. of England has ordered 20 locomotives from the Baldwin Works, of the same type as those building for the Midland Ry. of England. The Chicago & Northwestern has ordered 300 furniture cars. Chesapeake & Ohio, 1 000 box cars. St. Paul & Duluth, about to order 500 box cars. Rock Island will build 300 cars. Toledo & Ohio Central is asking bids on about 1,000 box cars. The Canada & St. Paul will build about 1,000 box cars. Other roads have placed orders for about 995 freight cars.

THE Empire Iron & Steel Co., in which Rogers, Brown & Co. and Eastern capitalists are interested, has acquired the Henry Clay furnaces at Reading, Pa. There are two stacks, each 57x13 feet, originally built in 1842 and rebuilt several times, having an annual capacity of 36,000 gross tons. Berks and Lebanon county ores are used. The statement that the Empire Iron & Steel Co. has taken the Ft. Payne, Ala., furnace is incorrect. Only portions of the equipment were purchased, for use in equipping other stacks.

ALL the plants of the American Car & Foundry Co. are running to their full capacity. The company proposes to pay quarterly dividends, beginning June 1, 1899.

THE plant of the Canonsburg (Pa.) Iron & Steel Co. resumed operations April 4. Additions will be made to the plant.

CHILL MOLD FOR CASTING GEAR WHEELS.

The production of cast gears equal in accuracy to cut gears is the object sought in a recent invention of John H. Miller, of New Castle, Pa. The wearing surface is chill-hardened in casting, giving it durability by reducing wear and friction. At the same time the cost of manufacture is comparatively low. As is shown in the cuts (Fig. 1 being a top plan view of the mold with pattern and chills in position in the sand and Fig. 2 a vertical section), the hub, arms and rim of the wheel are molded in sand in the ordinary way, after which a ring or cheek-piece equal in depth to the face of the gear to be cast and accurately faced and bored, is placed upon the drag, centered and secured in place by flask-pins as shown. An iron pattern is used consisting of a rim carrying teeth corresponding to the teeth to be cast, and having supports which hold it in exact position relative to other parts of the mold, yet prevent its coming in contact with it at any point. Separate chills, converse in form to the teeth to be cast, and accurately gauged, are then dropped in between the pattern and the cheek-piece. These must be sufficiently accurate to permit the pattern, after they are all in place, to be lifted and turned one-fourth way around and again lowered to position.

Fig. 1.

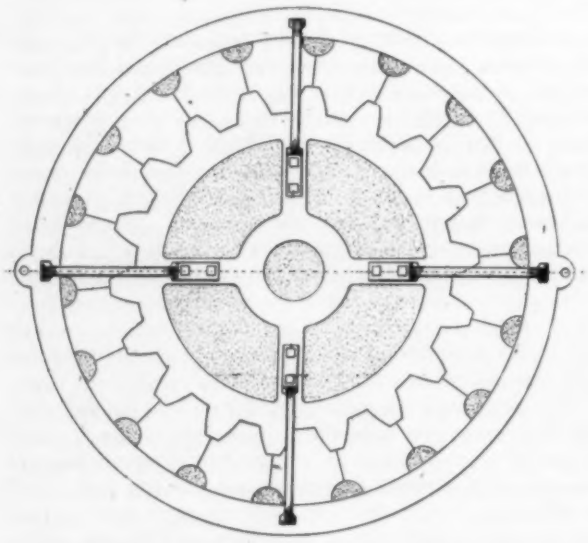
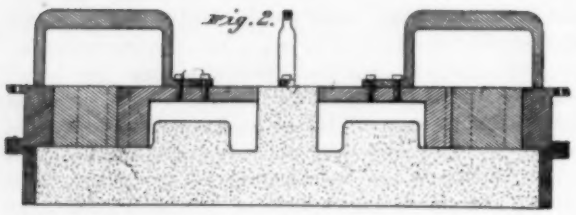


Fig. 2.



This is quite a severe test of accuracy, but it is stated that it is attained in practice. When the several parts of the mold are once perfected they can be used repeatedly, producing exact duplicates at each operation.

After the chills have been placed in position and the cores set, the iron pattern is removed and the mold closed in the ordinary manner. While the chills fit together snugly there is sufficient aperture to furnish an exit for gas to the openings at their rear, preventing blow-holes in the teeth and rim of the casting. The extent of the chill can be regulated as desired. As will be understood, the very best grades of iron are required for success.

Fig. 3 is reproduced from the photograph of a section of a spur gear manufactured by the use of the chill mold. It was designedly fractured at right angles to the teeth, for the purpose of exhibiting the uniformity and general character of the chill. The process is said to be adapted to the manufacture of a variety of gear work.

WORK on two of the old Paxton furnaces, South Harrisburg, Pa., is progressing rapidly, and it is expected that within the next week both furnaces will be lighted. Cuban ore will be used.

ADVANCES IN WAGES.

At Springfield, O., core makers of the Springfield Foundry Co., went on a strike March 29, demanding an increase of 10 per cent in wages. A meeting was called of all union and non-union molders and core makers, to take action to prevent a general strike, as some of the molders demand the immediate payment of a 10 per cent advance, which the foundries agreed to pay on May 1, as in Cincinnati and other points.

The Reading Stove Works, Reading, Pa., increased wages 10 per cent in every department.

The Terre Haute (Ind.) Iron & Steel Co. has raised wages 10 per cent of employes not under the scale.

The coal miners of the Tennessee Coal, Iron & R'y Co. and the Sloss Iron & Steel Co. received a further increase of 2½ cents per ton on April 1. This makes 5 cents increase since March 1.

The Falcon Iron & Nail Co., Niles, O., notified employes not governed by the Amalgamated Association scale of a 10 per cent increase.

On April 1, the Allentown Rolling Mill, at Allentown, Pa., increased wages 10 per cent. The company's furnace will soon be put again in blast.

The Delaware rolling mill at Philadelphia has advanced wages 10 per cent, beginning April 10.

The Bay View, Wis., members of the Amalgamated Association advocate a return to the wages paid before the 15 per cent cut of two years ago. Some favor asking an advance of 20 per cent.

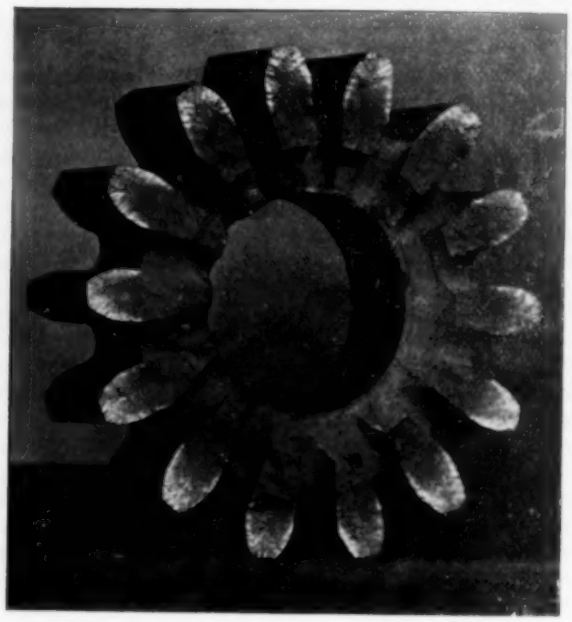


FIG. 3.

CHILL MOLD FOR CASTING GEAR WHEELS.

The North & Judd Mfg. Co., of New Britain, Conn., has given its molders an increase of 10 per cent, the first advance since the hard times.

The strike at the Ohio Tube Works, of Warren, O., has been settled. The men withdraw their demand for 13 per cent increase and accept the 10 offered.

The York rolling mill, at York, Pa., will increase wages 20 per cent on May 1.

The molders at Graff & Co.'s stove works, Sharon, Pa., will receive an advance of 10 per cent on May 1.

J. B. DOAN & Co., 68 and 70 S. Canal st., Chicago, Western representatives of the American Tool Works Co., Cincinnati, have issued a new catalogue of the tools made by the latter company. The catalogue shows a cut of the Chicago store, and illustrations of nearly all the tools made by the American company, with full descriptions of them. Many improvements are shown in tools which have been made since the last catalogue was issued. Doan & Co. report a good business, with a steadily increasing demand for tools of all kinds.

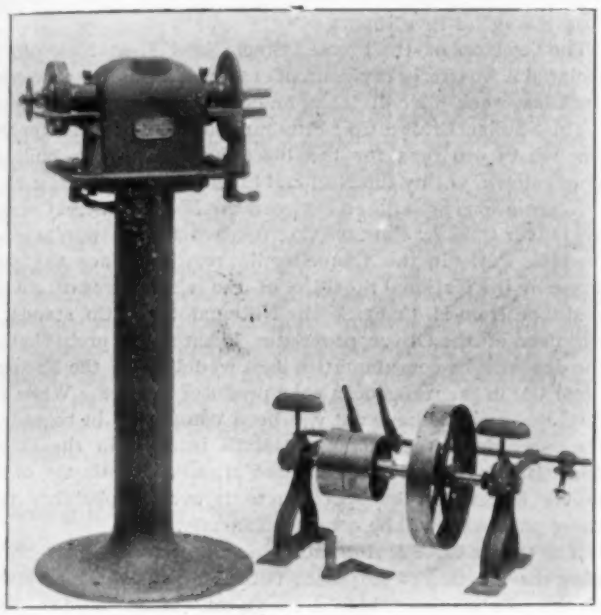
TOOL GRINDING MACHINE.

The Steiner Mfg. Works, Erie, Pa., are manufacturers of tools, emery grinders, metal patterns, and special machinery. One of their products is shown in the accompanying half-tone cut—a tool grinding machine. The spindle is of steel and runs in self-oiling babbit boxes provided with means of compensation for wear. It is turned down to one-half inch on the end, so that small wheels, as shown in the cut, may be readily put on for grinding cutters, taps, reamers, etc. The height to the spindle is 37 inches; the distance between wheels 12½ inches and the entire length of the spindle 20 inches. It will run wheels up to 10 inch diameter. The floor space occupied is 18 inches; the total weight of the machine 185 pounds.

The manufacturers started in business in Erie in 1892 and have been successful in building up a large trade.

Suit Over Iron and Steel Rates from Colorado.

The case of the Colorado Fuel & Iron Co. against the Southern Railway Co. has been taken from the United States Circuit Court at Denver and filed in the United States Circuit Court of Appeals sitting at St. Paul next month, and June 1 has been set as the day for hearing. The contest is over the report of Special Master Hinsdale. The original suit was for an injunction to restrain certain roads from advancing rates on iron and steel, as they had threatened to do. The rates



TOOL GRINDING MACHINE.

between Pueblo and the Pacific coast had been lowered by order of the Inter-State Commerce Commission when it was shown that the lines were hauling iron and steel from Chicago to San Francisco cheaper than from Pueblo to San Francisco, although Pueblo was a thousand miles nearer. The Colorado Fuel & Iron Co also demanded heavy damages for loss of business accruing from the excessive rates.

Master Hinsdale found that the rates desired by the Colorado Fuel & Iron Co., i.e., 45 cents per 100 pounds on steel rails and fastenings, and 37½ cents per 100 pounds on bar iron cast iron water pipe, pig iron billets, rivets, spikes and other steel and iron articles, from Pueblo to San Francisco, Sacramento, San Jose, Stockton, and Marysville, California, in carload lots, are reasonable and just to the railways, and were so during the period from October, 1892, to October 28, 1898.

The master found, in addition, that the refusal of the defendants, especially the Southern Pacific Co., to introduce such rates in October, 1892, and maintain them and in maintaining a rateof $1.60 per 100 pounds, was unjust and unreasonable and in violation of the act to regulate commerce. By reason of such violation he found that the fuel and iron company had sustained damages in the sum of $35,300 and that judgment for the same should go against the Southern Pacific Co., as it was proven that that line, because of its monopoly of the entrance into San Francisco was in the position to dictate, and did dictate, what tariffs should prevail over lines occupying the position of feeders.

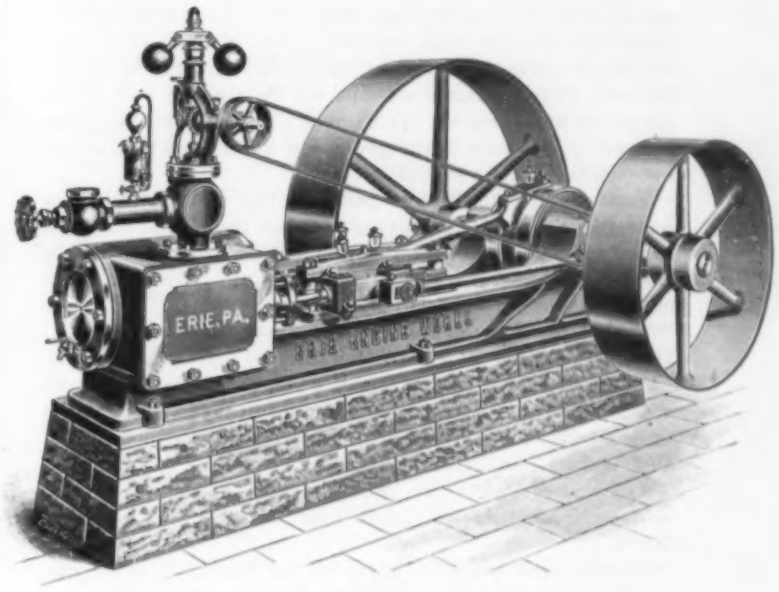
DETACHED CENTER-CRANK ENGINE.

The type of engine shown in the illustration below is manufactured by the Erie Engine Works, of Erie, Pa., and is known as their detached, center-crank engine. In many cases it is preferred to the side crank engine, being more easily erected, since it requires no extra foundation for out-end bearing. The cylinders are set low as in the side-crank engines of the same company. The cranks are solid forgings slotted out, having no welds, and full disc crank balances give perfect balance to reciprocating parts. The slides and cross head are of more than ordinary length and width giving large wearing surfaces.

The Erie Engine Works make these engines of from 6 to 125 h. p. About 6,000 of them are now in use. The company has manufactured engines for the past 20 years and has built up a large export trade in addition to an important and growing business in the United States.

The New Prices of Cast Iron Pipe.

Recent bids on municipal work give some idea of the basis on which business will be done by the newly formed United States Cast Iron Pipe & Foundry Co. At Chicago bids were opened on April 13 for 7,000 tons of cast iron water pipe. The only competitor of the pipe works consolidation was the American Car & Foundry Co. The latter has pipe foundries in connection with the plants of the Michigan-Peninsular Car



DETACHED CENTER-CRANK ENGINE.

Co., and the Jackson & Woodin Mfg. Co., Berwick, Pa. The successful bidder was the United States Cast Iron Pipe & Foundry Co. Its bid was $23.48 per ton, an advance over the price of last year of $7.50. The bid of the American Car & Foundry Co. was $24.43.

At Detroit on April 12 two bids were opened for the city's supply of cast iron pipe for the coming year. That of the American Car & Foundry Co. was $22.50 per ton up to 500 tons, but the company would not supply beyond that amount, except at $23.50, in view of the condition of the iron market. The bid of the United States Cast Iron Pipe & Foundry Co. is reported at 25 cents higher than the above figures. Last year's Detroit contract was a trifle below $15. With an advance of $4.50 in forge and Nos. 3 and 4 foundry irons since last year's contract it would appear that the bids in both cities are based on a net advance by the pipe foundries of about $3 a ton.

A MONTREAL dispatch says that at a meeting of Canadian iron manufacturers, held there, it was decided to advance prices 10 to 20 per cent in sympathy with the rise in American and English markets.

F. R. PHILLIPS' SONS CO., Philadelphia, Pa., which installs rolling mill and tin mill machinery, announces that it has moved into its new offices, No. 18 S. Broad st., on the west side of the city hall, near the Pennsylvania Railroad depot.

INDUSTRIAL SUMMARY.

[If you are in need of machinery of any description, please notify *The Iron Trade Review*, and we will put you in communication with our advertisers at once.]

New Buyers in the Market, and Some of Their Wants:—

The Scranton Bolt & Nut Co., recently organized at Scranton, Pa., has elected as directors: W. D. Zehnder, L. M. Horton, C. H. Wells, William Connell, John Jermyn, T. H. Watkins and J. A. Lansing. It is expected that a plant will be constructed as soon as a site is secured.

The Standard Computing Scale Co., of Detroit, has been organized with $150,000 capital. Two vacant buildings are being considered but the company in time will erect its own plant. Francis C. Osborne and L. Jaehnichen are the principal stockholders. The officers are: Thos. F. Comerford, president; Fred. P. Goettman, treasurer, and Francis C. Osborne, secretary. These, together with Oscar B. Marx, Dr. F. G. Miner, John Schweikart and Joseph M. Bucher, will form the board of directors.

New Construction:—

A contract has been awarded to Riter & Conley, of Pittsburg, by the Shenango Machine Co., Sharon, Pa., for the erection of a brick and iron foundry building, 150x100 feet, also two electric traveling cranes and two melting furnaces. The capacity of the concern will be doubled.

The Falk Co., of Milwaukee, which controls the patent for welding rails and manufactures railroad frogs, switches, joints and so forth, will build a new plant in the Menominee valley. There will be three large buildings—two machine shops and one power house. The cost of the entire plant will be about $80,000. The two machine shops will be 100x127 feet, while the power house will be 64x127 feet. A new Corliss engine of 125 h. p. will furnish the power and an independent motor for each tool will be provided.

The Great Northern will build a steel elevator at West Superior, Wis., with a capaity of 6,000,000 bushels, to cost over $2,000,000. Contract for the foundation has been let to Schmidt Bros., of West Superior, for $85,000. Between 9 000 and 10,000 tons of steel will be used.

The additions to the plant of the Long & Allstatter Co., Hamilton, O., are chiefly to the foundry and making room for storing patterns. The foundry when completed will be 206 feet long, with two 30-ton cranes traveling the entire length. There will be additional core ovens, rooms for sand, supplies, etc., all under one roof.

The Midvale Steel Co., Nicetown, Philadelphia, will build at once an addition 64x114 feet to its ordnance machine shop No. 1.

At Cincinnati work has begun on the Fosdick Tool Works, to be located at the corner of Blue Rock and Apple sts.

The Fort Pitt Bridge Co. has received the contract for the construction of the sheet mill for the Chester Rolling Mill Co., a Pittsburg concern, which is to locate at Chester, W. Va.

The L. Wolff Mfg. Co., Chicago, has commenced the erection of a $10,000 addition to its Carroll ave. plant. The new building will be three stories high and will cover an area of 65x123 feet.

The Great Western Manufacturing Co., Leavenworth, Wis., will erect an addition to its machine pllant, to cost $10,000.

At Fontana, Wis., W. Vroman is erecting a machine shop.

Fires and Accidents:—

The plant of the Interstate Malleable Iron Works at West Duluth, Minn., was damaged $3,000 by fire on April 12. Fire originated in the comb of the roof, catching from the cupola.

The plant of the Star Foundry & Machine Works at Oshkosh, Wis., was damaged by fire on April 12. Loss $20,000; insurance, $8,000.

The Twin City Iron Works at Ironwood, Mich., owned by E. Charbonneau, were completely destroyed by fire on April 12. The loss is $40,000. The owner has a foundry at Hurley, Wis., which will probably be equipped at once and started up.

Fire destroyed the large bar and finishing mill of the East Lebanon Iron Co., Lebannon, Pa., April 13. The mill was run on double turn. The loss is $40,000, partly covered by insurance.

Power Equipment and Machine Tools.

Good business is reported by Hill, Clarke & Co., of Boston and Chicago. One of the orders received last week comes from Sweden, and is for a 16-foot planer, to weigh 80,000 pounds. A cable order was also received for a large boring mill to go into the machine shop equipment of the Baroda Railway of Bombay, India. Both foreign and domestic demand are lively.

Messrs. Harriman & Co., of New York, offer for subscription at par $200,000 cumulative 7 per cent preferred stock in the Garvin Machine Co., which manufactures machinery and machine tools.

One of the large orders now on hand at the plant of Wm. Tod & Co., Youngstown, O., is for the blowing engines for the Ohio Steel Co.'s blast furnace plant. To carry the castings from the maker's plant to the furnace site an effort will be made to get the special car built to carry the Krupp gun from the seaboard to the World's Fair. Its capacity is 200,000 pounds. The beds of the compound engine weigh 56 tons apiece. The main shaft, with cranks, weigh 58 tons.

The Pittsburg District:—

A second order for 120 motors for the Glasgow (Scotland), Tramway Co., has been placed with the Westinghouse Co. The first order was for 81 motors.

Thomas Walker, formerly president of the Pittsburg Wire Co., has bought 10 acres of land adjoining the works of the American Steel & Wire Co., at Rankin, Pa., but it is said there is no present intention of building a wire nail plant, the purchase being for investment.

The directors of the Pressed Steel Car Co., at New York, declared a quarterly dividend of 1¾ per cent on preferred stock last week. No dividend on common stock was declared.

The Shiffler Bridge Co., Pittsburg, has the contract for the erection of ore bins for the blast furnaces being built at Youngstown, O., by the National Steel Co.

Negotiations are still on between the National Steel Co. and the Oliver Coke & Furnace Co., relative to the purchase of the coke works in the Connellsville region. Since the purchase by the National Steel Co. of the 1,200 acres of coking coal land from H. C. Frick the National Steel Co. stands in less need of the Oliver properties, but it seems probable that the deal will be consummated, as it would place the National Steel Co. in the ranks of a coke producer at once. While the final negotiations have not yet been completed in regard to the purchase of the Oliver one-sixth interest in the Oliver Iron Mining Co., and the Rosena Furnace, New Castle, of the Oliver & Snyder Steel Co., there is every probability that these purchases will be concluded shortly.

The Oliver Coke & Furnace Co., Pittsburg, is just beginning the erection of a plant at Uniontown, Pa., for repairs on the railroad cars which it owns, and ultimately the plant will be equipped for building such cars.

The Chester Rolling Mill Co., Ferguson Building, Pittsburg, has let to the Ft. Pitt Bridge Co., a contract for the building for its sheet mill to be erected at Chester, W. Va., opposite East Liverpool. The building will be 130x300 feet, the main span being 70 feet, which will be traversed by a 30-ton electric crane.

Fulton Furnace of the Globe Iron Co., Jackson, O., a stack making high silicon softeners from local ore, is to be completely remodeled, three stoves being erected instead of the one now used, with new blowing capacity and boilers, etc. David Lamond, Pittsburg, has the contract.

Some wholly erroneous statements have appeared in the daily papers to the effect that W. C. Cronemeyer, vice-president and treasurer of the United States Iron & Tin Plate Mfg. Co., until the sale of its property to the American Tin Plate Co., was engaged in a project to build a tin plate plant at Port Angeles, Wash., "to use local ore and fuel." The report probably originated from the fact that Mr. Cronemeyer, before assuming his duties as representative of the American Tin Plate Co. in Pittsburg district, spent a brief vacation in the State of Washington. There seems to be no question that there is the basis in and near Port Angeles for an extensive iron industry, which would have to be developed from the ground up by the opening up of ore and coal mines and the establishment of coke works and blast furnaces. The consumption of pig iron on the Pacific coast is estimated now at about 100,000 tons a year, and this would naturally be the first outlet for the product of any such venture, but Mr. Crone-

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The boilers in our establishment have been fed continuously for many years with water from an open heater—not a sign of oil to-day, and not a particle of trouble during from oil that time. How do we do it? Of course, it's a secret, but we'll tell you if you will agree to tell somebody else.

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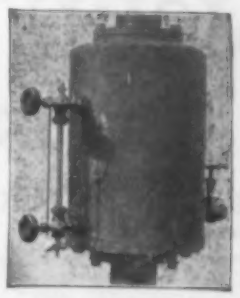

A Cochrane Separator. Vert. Form.

By the way, the open heater keeps an awful lot of scale out of boilers—if you are troubled with mud, carbonates and sulphates of lime and magnesia, try one—you will NEVER use any other kind.

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meyer absolutely disavows connection with any industrial project in the region.

A movement is being made by molders in the Pittsburg district toward the securing of a uniform base rate of wages of $2.75, the former rate having been $2.50. A number of firms have granted an advance of 10 per cent already, and it is desired to bring the others into line.

The Chicago District:

J. J. Ryan & Co, brass founders, 68 West Monroe st., Chicago, have recently made a very large shipment of special brass castings, nickel plated, trimmings for closet work, to Havanna, in connection with the Government Sanitary Commission's work there. This is probably the first shipment of this kind ever made to Cuba from the United States. This was a rush order, Ryan & Co. getting it out in one week, and being the only concern competing which could fulfill the shipping requirements. Ryan & Co. report general business much better in the past few weeks. The foundry and babbitt metal departments have increased their business in the quarter just passed over 100 per cent above the same period of last year. Among recent orders was one for 500,000 brass castings. Particular activity is noticed also in the brass pattern department.

General Industrial Notes:—

A Wall st. report says: It is claimed for the Cambria Steel that the company is now earning on a basis close to $150,000 net for month. After allowing for $120,000 interest on the Cambria Iron collateral trust notes and for $340,000, the amount of the guaranteed 4 per cent dividends, this means earnings of about 8 per cent on the par ($50) of the $16,000,000 Cambria Steel stock.

The Chicago *Economist* says that the net earnings of the American Steel & Wire Co. in the month of February were $1,059,768. The March figures were expected to come close to $1,500,000.

The demand at Youngstown, O., for labor in connection with iron and steel plants exceeds the supply. No. 1 puddle mill of the Brown-Bonnell Iron Co. has been in need of men. The Ohio Steel Co. could use 200 additional men.

The Eleanor Iron Co., of Harrisburg, has leased the Hollidaysburg, Pa., rolling mill for the term of three years.

At Sharon, Pa., the new vitrified paving brick plant of J. V. Rose is in operation. The plant was recently built at a cost of $35,000, and will produce 50,000 brick per day.

The Baldwin Locomotive Works have completed their first contract for 10 engines for the Midland Railroad, of England. The contract was placed Dec. 17, 1898, and called for their delivery about the middle of April.

Leesport Furnace at Leesport, Pa., has been taken by Philadelphia interests, the purchase being made from Jeremiah S. Parvin and James R. Weisner, who bought the property at sheriff's sale recently.

The puddle mills of the Seyfert Iron Co, idle for eight months, have been started up at Reading, Pa.

The Claire furnace, at Sharpsville, Pa., made 1,870 tons of Bessemer pig iron in seven days recently, the largest amount ever turned out of the furnace in the same time.

The Reading, Pa., Iron Co. posted notices last week of an increase in wages to take effect May 1. This is the second advance given this spring, both being voluntary.

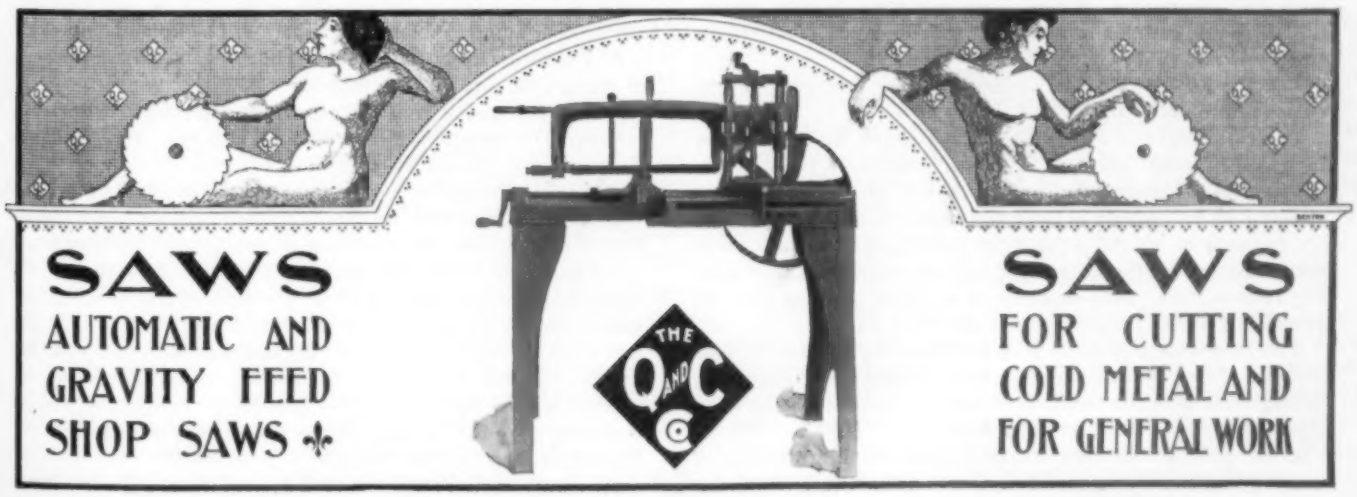
The Inland Iron and Forge Co., East Chicago, Ind., made an output of over 5,000 tons in March, though the rated capacity of the plant is but 40,000 tons a year.

The Michigan Iron & Steel Co., Muskegon, Mich., ran its first heat on March 29, and the plant is now in full operation.

The Garden City Wire & Spring Co., Chicago, which erected a wire rod train in 1898, produces wire rods for its own consumption and for sale.

The Cooke Locomotive Co., of Paterson, N. J., has again carried off an order for five locomotives in competition with English manufacturers for the Barry Railway in Wales.

The National Pneumatic Tool Co., of Philadelphia, which succeeded to the business of the C. H. Haeseler Co., March 1, reports largely increased business. Recent orders include 36 drilling and reaming machines for the Schoen Pressed Steel



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Co., 10 for the Atlantic Works, East Boston; 11 drills for the Baldwin Locomotive Works; four for the Dickson Manufacturing Co., besides a number of drills and hammers in smaller lots to other concerns.

The Tyrone Iron Co., at Tyrone, Pa., will advance wages 10 per cent on May 1.

The Hall Furnace, at Sharon, Pa., operated by the Sharon Iron Co., resumed last week, after an idleness of three years.

The Reese-Hammond Fire Brick Co., of Bolivar, Pa., is running its four plants to their full capacity, and is doubling the capacity of its No. 4 plant by putting in new machinery, erecting a new dryer 32 in. x 184 in. and other buildings, giving 12 new kilns. It is expected in 60 days to have the capacity of the No. 4 plant up to 75,000 brick a day.

The Interstate Malleable Iron and Machine Works, of West Duluth, Minn., contemplate enlargement and are endeavoring to negotiate with the Oshkosh Board of Trade to secure inducements to establish a branch there.

Contractors are at work installing the Uehling method of casting and conveying metals at the Bellaire Steel Works department of the National Steel Co., at Bellaire, O. The apparatus is expected to be completed by June 1, after which the present system of casting in sand will be abandoned.

At the Ohio Steel Co.'s plant, Youngstown, O., an output of 43,000 tons was made in March.

Hubbard Furnace of the Andrews & Hitchcock Iron Co., Hubbard, O., was blown in two weeks ago and is producing 240 tons a day of foundry iron.

Uehling's method of casting and conveying metals, which was installed recently at the Lebanon Furnaces, Lebanon, Pa., is now successfully handling the output of the furnaces.

Ebenezer A. Hyde, formerly in business with Joseph F. Forsyth under the firm name of Forsyth, Hyde & Co., confessed insolvency in the United States District Court at Chicago last week by scheduling debts aggregating $541,000, with no assets. All the debts were contracted before July, 1893, at which time the partnership was dissolved. Mr. Hyde was a shareholder in the Chicago Foundry Co., Bouton Foundry Co., Buffalo Mining Co. and Wisconsin Furnace Co.

At New Castle, Pa., a suit on a $75,000 mortgage has been

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For covering buildings exposed to severe conditions, such as machine shops, foundries, etc. No paper to tear. No tar to run or melt. Absolutely the best. Has as a foundation the best wool felt. Not affected by acids, alkalies, coal-gas, steam, oil, grease or by great heat. Waterproof. Durable. Easily laid. . . . . .

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KENTUCKY FIRE BRICK WORKS.

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KENTUCKY FIRE BRICK WORKS, PORTSMOUTH, O. HIGH GRADE FIRE BRICK BEST BLAST FURNACE & ROLLING MILL BRICK

STEEL WORKS BRICK.

FIREBRICK, KY.

Ore and Coal Handling Machinery

For Blast Furnaces, Docks and Mines.

MINING MACHINERY,
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Regenerative Gas Furnaces and Water Seal Gas Producers.

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SUITABLE FOR
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OAK HILL FIRE BRICK AND COAL CO.,
OAK HILL, OHIO.

brought against the New Castle Engineering Works, to have the plant sold. This plant was formerly owned by J. P. Witherow, of Pittsburg.

The Tonawanda Iron & Steel Co., North Tonawanda, N. Y., will blow out its furnace in a few days, to put in a new hearth and bosh. The company is installing at this furnace an additional E. P. Allis Co. blowing engine.

The Madison Car Works have received an order for 1,000 cars from the Chicago, Burlington & Quincy Railroad, and one for 500 box cars and 200 flat cars for the Wabash Railroad.

The La Belle Iron Co., the new owner of the Jefferson Iron Co. mill at Steubenville, O., started up the plant this week on skelp iron.

The committee of stockholders of the Ohio Iron Co., Zanesville, O., which secured the appointment of a receiver some time ago, has issued a circular stating that the committee has an offer of $22.50 a share in cash for the stock of the company, the purchaser to relieve the selling stockholders of allp resent liabilities and to secure them against all claims which may arise after the transfer of the stock. The circular states further that the committee has accepted the offer and recommends that all other owners of stock do likewise.

The Palm Gas Engine Co., of Butler, Pa., has leased the Kreps Bros. foundry and machine shop at Greenville, Pa., and will convert the buildings into a gas engine works.

At Portland, Me., the Bay State Machine Co. has been incorporated with a capital of $110,000 for the manufacture and sale of machinery. The officers are John F. Ross, Boston, president; Frank H. Bates, Boston, treasurer.

At Chester, Pa., the Wellman Steel Works will be operated as soon as a charter has been granted to the Tidewater Steel Co., for which application will be made on April 28. The incorporators are George S. Graham, Isaac N. Solis, R. E. Robinson, George McCall and Edward F. Glenn. The company will manufacture iron and steel and the capital stock will be $1,500,000.

The stockholders of the Fairview Mfg. Co., Fairview, Ill., met in the First National Bank Building, Chicago, April 10, and elected new officers. T. T. Wood, of Racine, Wis., was made manager. The plant which will be occupied at Fairview will be remodeled and a malleable iron foundry built at once, 260x76 feet. The present gray iron foundry will be extended 30 feet, and other buildings provided as may be needed.

Cleveland & Buffalo Rates in 1899.

Circular No. 6, of the Cleveland & Buffalo Transit Co., announces that the company will reduce its berth and state room rate between Cleveland and Buffalo, so that outside rooms will be $2 and inside rooms $1.75; upper berths 75 cents, and lower berths, $1 and $1.25. Boats leave Cleveland every evening at 8, Central time, and Buffalo at 9 p. m., Eastern time, making the run of 183 miles in 10 hours.

Metallurgical Furnaces

We design and build Metal Working Furnaces for every purpose, using any fuel.

We manufacture and install the most modern appliances for burning fuel oil.

Satisfactory operation guaranteed.

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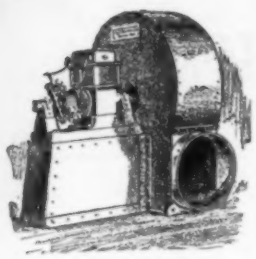

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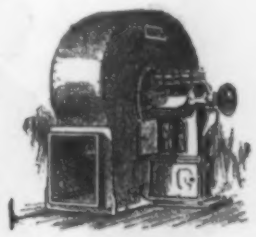

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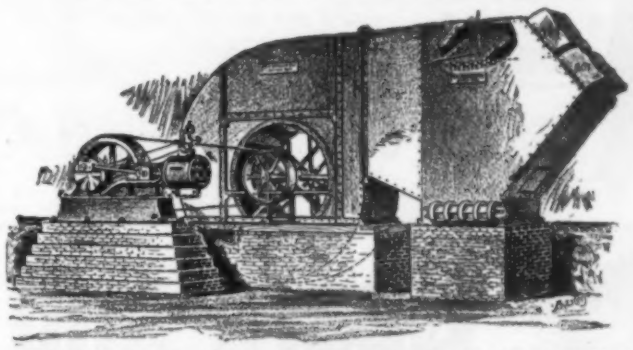

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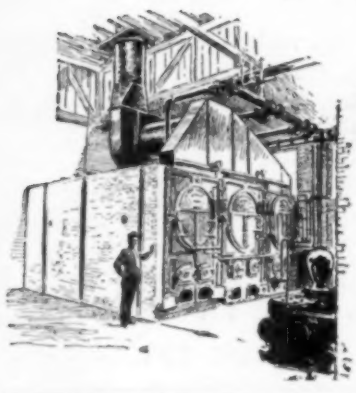

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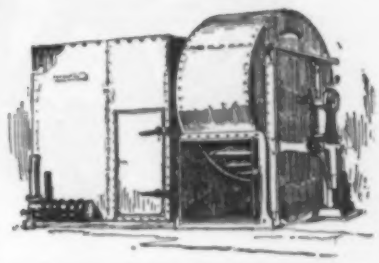

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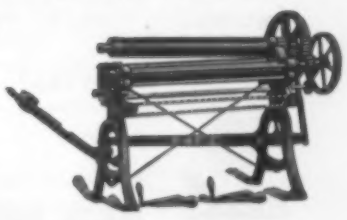

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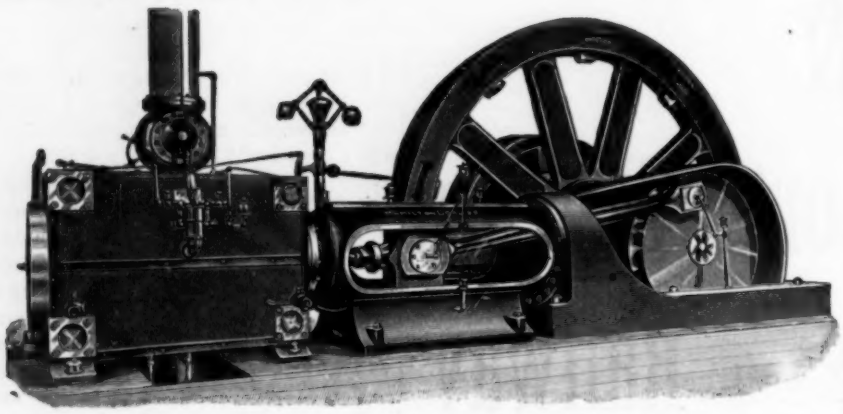

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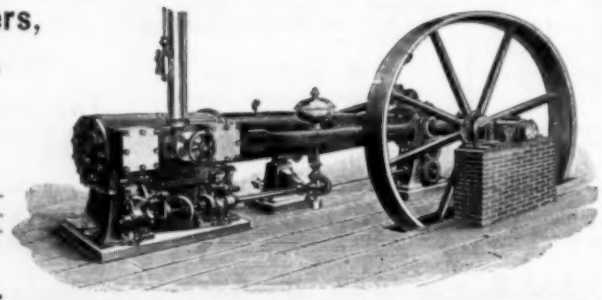

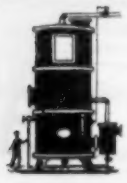

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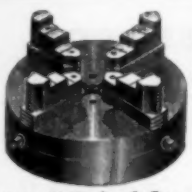

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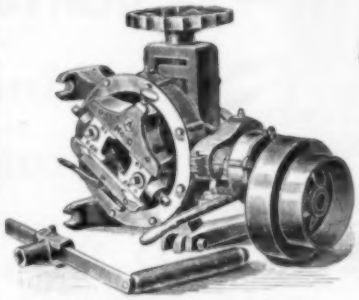

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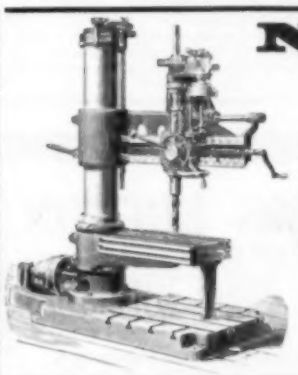

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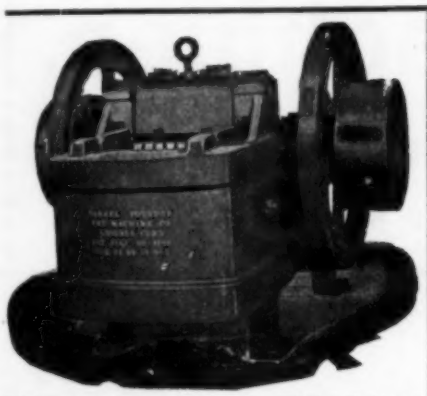

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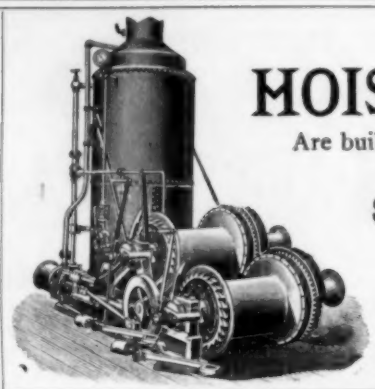

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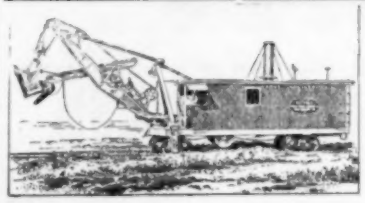

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Baltimore and Washington	* 2:10 pm	*11:30 am
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Ravenna and Alliance	* 5:00 pm	* 8:45 am
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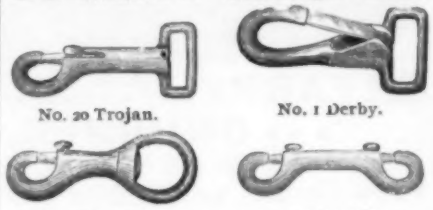

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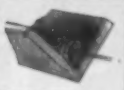

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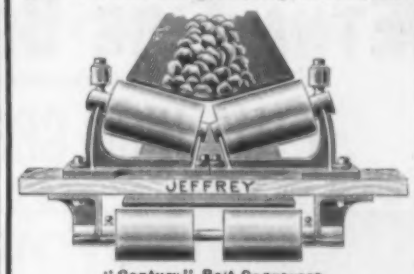

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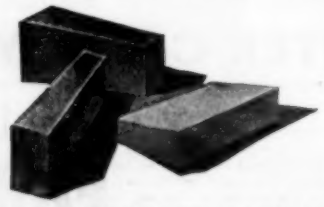

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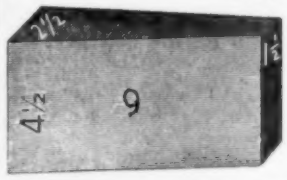

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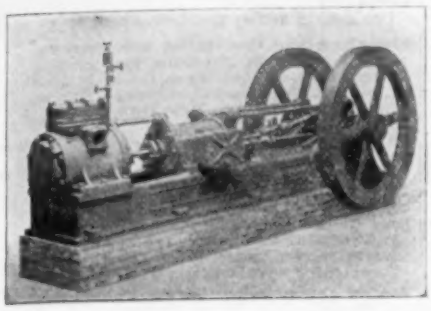

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Engines (Oil)—
The Aultman Co., Canton, O.

Engines (Steam)—
Wm. Tod & Co., Youngstown, O.
B. F. Sturtevant Co., Boston, Mass.
The Edward P. Allis Co., Milwaukee, Wis.
The Hooven, Owens & Rentschler Co., Hamilton, O.
Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Geo. B. Sennett Co., Youngstown, Ohio.
I. & R. Greenwald Co., Cincinnati, O.
Webster Camp & Lane Machine Co., Akron, O.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.
Fraser & Chalmers, Chicago, Ill.

Engravers and Electrotypers—
Central Electrotype & Engraving Co., Cleveland, O.
National Engraving Co., Cleveland, O.,

Exhaust Heating Apparatus—
B. F. Sturtevant Co., Boston, Mass.

Fans—
American Gas Furnace Co., New York City.
B. F. Sturtevant Co., Boston, Mass.

Feed Water Heaters and Purifiers—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Harrison Safety Boiler Works, Philadelphia, Pa.
James Bonar & Co., Pittsburg, Pa.

Files, Makers of—
C. H. Besly & Co., Chicago, Ill.

Fire Brick and Clay—
J. V. Rose, Sharon, Pa.
Union Mining Co., Mt. Savage, Md.
Clearfield Fire Brick Co., Clearfield,
Dover Fire Brick Co., Cleveland, Pa.
F. B. Stevens, Detroit, Mich.
The S. Obermayer Co., Cincinnati, O.
Chicago Fire Clay Product Co., Chicago, Ill.
Columbia Fire Clay Co., Cleveland, O.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Detroit. Mich.
Garden City Sand Co., Chicago, Ill.

Fire Proof Covering—
C. H. Besly & Co., Chicago, Ill.

Flexible Shafts—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

Foot and Power Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.
Foundries—
Wm. Tod & Co., Youngstown, O.
Seaman, Sleeth Co., Pittsburg, Pa.
The Lane & Bodley Co., Cincinnati, O.
Hooven, Owens & Rentschler Co., Hamilton, O.
W. A. Jones Foundry Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
Brass Founders' Supply Co., Newark, N. J.
The Aultman Co., Canton, O.
Riverside Foundry Co., Cleveland, O.
I. & E. Greenwald Co., Cincinnati, O.
Wheeling Mold & Foundry Co., Wheeling, W.Va.
Foundry Equipments—
The S. Obermayer Co., Cincinnati, O.
Foundry Supplies—
Clearfield Fire Brick Co., Clearfield, Pa.
The Ohio Sand Co., Conneaut, O.
Union Mining Co., Mt. Savage, Md.
Dover Fire-Brick Co., Cleveland, O.
Tabor Mfg. Co., Elizabeth, N. J.
F. B. Stevens, Detroit, Mich.
Millett Core Oven Co., Brightwood, Mass.
Cleveland Facing Mill Co., Cleveland, O.
The S. Obermayer Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
Chicago Fire Clay Product Co., Chicago, Ill.
Brass Founders' Supply Co., Newark, N. J.
Columbia Fire Clay Co., Cleveland, O.
Vulcan Mfg. Co., Pittsburg, Pa.
Scioto Star Fire Brick Works, Portsmouth, O.
Kentucky Fire Brick Works, Portsmouth, O.
Webster Fire Brick Co., South Webster, O.
Ætna Fire Brick Co., Oak Hill, O.
J. V. Rose, Sharon, Pa.
Oak Hill Fire Brick & Coal Co., Oak Hill, O.
Holmes, Strachan & Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.
Foundry Facings—
The S. Obermayer Co., Cincinnati, O.
Cleveland Facing Mill Co., Cleveland, O.
Forgings—
Cleveland City Forge & Iron Co., Cleveland, O.
Bethlehem Iron Co., South Bethlehem, Pa.
Braeburn Steel Co., Braeburn, Pa.
Wyman & Gordon, Worchester, Mass.
Friction Metal—
C. H. Besly & Co., Chicago, Ill.
Swarts Metal Refining Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
Furnaces—
Brightman Furnace Co., Cleveland, O.
Playford Stoker Co., Cleveland, O.
Furnace Linings—
Union Mining Co., Mt. Savage, Md.
Fuel Oil Burners—
W. S. Rockwell & Co., New York City.
American Gas Furnace Co., New York City.
Galvanized Iron—
Apollo Iron & Steel Co., Pittsburg, Pa.
Galvanizers—
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Apollo Iron & Steel Co., Pittsburg, Pa.
Galvanizing Pots—
The Wm. B. Pollock Co., Youngstown, O.
Gas Burners—
American Gas Furnace Co., New York City.
Gas Furnaces—
American Gas Furnace Co., New York City.
Gearing.
I. & E. Greenwald Co., Cincinnati, O.
Gear Cutting—
The R. D. Nuttall Co., Allegheny, Pa.
Brainard Milling Machine Co., Hyde Park, Mass.
The Van Dorn & Dutton Co., Cleveland, O.
Gear Cutters—
Brainard Milling Machine Co., Hyde Park, Mass.
Gear Lubricants—
The Ironsides Company, Columbus, O.
Grindstones—
C. H. Besly & Co., Chicago, Ill.
Graphite Paint—
Jos. Dixon Crucible Co., Jersey City N. J.,
Grate Bars—
Geo. B. Sennett Co., Youngstown, Ohio.
Gray Iron Castings—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O
Brass Founders' Supply Co., Newark, N. J.
Hack Saws—
Millers Falls Co., New York City.
Q & C Co., Chicago, Ill.
Hangers—
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.
Harness Snaps—
Covert Mfg. Co., West Troy, N. Y.
Hoists—
Edwin Harrington Son & Co., Philadelphia.
Reading Crane & Hoist Works, Reading, Pa.
The Lane & Bodley Co., Cincinnati, O.
The Aultman Co., Canton, O.
Lidgerwood Mfg. Co., New York City.
Heaters and Purifiers—
Harrison Safety Boiler Works, Philadelphia.
Stilwell-Bierce & Smith-Vaile Co., Dayton O.
James Bonar & Co., Pittsburg, Pa.
Heating and Ventilating Apparatus
B. F. Sturtevant Co., Boston.
Heavy Hardware—
C. H. Besly & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.
Hoisting Engines—
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Lidgerwood Mfg. Co., New York City.
The Aultman Co., Canton, O.
Webster, Camp & Lane Machine Co., Akron, O.
Hoisting Machinery—
Link-Belt Machinery Co., Chicago, Ill.
Reading Crane & Hoist Works, Reading, Pa.
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
Earl C. Bacon, New York City.
Lidgerwood Mfg. Co., New York City.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
The Brown Hoisting and Conveying Machine Co., Cleveland, O.
Horse Shoes—
Phoenix Horse Shoe Co., Joliett, Ill.
Hotels—
United States Hotel Co., Cleveland, O.
Hydraulic Machinery—
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Injectors—
C. H. Besly & Co., Chicago, Ill.
Insurance Companies—
Hartford Steam Boiler I. & I. Co., Hartford, Ct.
Iron Buildings—
Shiffler Bridge Co., Pittsburg, Pa.
Riter-Conely Co., Pittsburg, Pa.
Iron Nails and Steel—
Bethlehem Iron Co., South Bethlehem, Pa.
C. H. Besly & Co., Chicago, Ill.
E. H. Stroud & Co., Chicago, Ill.
Parkhurst & Wilkinson Co., Chicago, Ill.
Iron and Steel Roofing—
Berger Mfg. Co., Canton, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
Iron Ore—
Lake Superior Consolidated Iron Mines New York City, N. Y.
Oglebay, Norton & Co., Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
Drake Bartow & Co., Cleveland, O.
Iron Working Tools—
H. Bickford, Lakeport, N. H
C. H. Besly & Co., Chicago, Ill.
The F. B. Shuster Co., New Haven, Conn.
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
The Armstrong Mfg. Co., Bridgeport, Conn.
Bickford Drill & Tool Co., Cincinnati, O.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Brainard Milling Machine Co., Hyde Park, Mass.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.
Link Belting—
The Jeffrey Mfg. Co., Columbus, O.
Link-Belt Machinery Co., Chicago, Ill.
Heyl & Patterson, Pittsburg, Pa.
The Aultman Co., Canton, O.
Ladles—
The S. Obermayer Co., Cincinnati, O.
Lathes—
U. Baird Machinery Co., Pittsburg, Pa.
Edwin Harrington, Son & Co., Philadelphia.
Bickford Drill & Tool Co., Cincinnati, O.
Machinery Name Plates—
August Becker, Boston, Mass.
Machinists' Tools and Supplies—
H. Bickford, Lakeport, N. H.
C. H. Besly & Co., Chicago, Ill.
U. Baird Machinery Co., Pittsburg, Pa.
Bertsch & Co., Cambridge City, Ind.
Edwin Harrington Son & Co., Philadelphia, Pa.
Fox Machine Co., Grand Rapids, Mich.
Armstrong Bros. Tool Co., Chicago, Ill.
Bickford Drill & Tool Co., Cincinnati, O.
Parkhurst & Wilkinson Co., Chicago, Ill.
Skinner Chuck Co., New Britain, Conn.
Cleveland Tool & Supply Co., Cleveland, O.
Baush & Harris Machine Tool Co., Springfield, Mass.
Massey Vise Co., Chicago, Ill.
Machinists' Vises—
Massey Vise Co., Chicago, Ill.
Machine Screws—
C. H. Besly & Co., Chicago, Ill.
Machine Shops—
The R. D. Nuttall Co., Allegheny, Pa.
The Lane & Bodley Co., Cincinnati, O.
Machinery and Tool Steel—
C. H. Besley & Co., Chicago, Ill.
Braeburn Steel Co., Braeburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.
Morris & Bailey Steel Co., Pittsburg, Pa.
Magnesia Covering—
C. H. Besly & Co., Chicago, Ill.
Manufacturing Chemists.
We Fu Go Co., Cincinnati, O.
Manufactured Iron & Steel—
Bourne-Fuller & Co., Cleveland, O.
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Parkhurst & Wilkinson Co., Chicago, Ill.
Ohio Steel Co., Youngstown, O.
Metal Bearings—
C. H. Besly & Co., Chicago, Ill.
Perfect Lubricating Metal Co., Cincinnati, O.
Merchant & Co., Inc., Philadelphia, Pa.
Swarts Metal Refining Co., Chicago, Ills.
Milling Machines—
U. Baird Machinery Co., Pittsburg, Pa.
Fox Machine Co., Grand Rapids, Mich.
Brainard Milling Machine Co., Hyde Park, Mass.
Mining Machinery—
C. H. Besly & Co., Chicago, Ill.
The Edward P. Allis Co., Milwaukee, Wis.
Earle C. Bacon, New York City.
The Lane & Bodley Co., Cincinnati, O.
Jeffrey Mfg. Co., Columbus, O.
Lidgerwood Mfg. Co., New York City.
Wm. Cramp & Sons, Philadelphia, Pa.
The Bucyrus Co., South Milwaukee, Wis.
Marion Steam Shovel Co., Marion, O.
Webster, Camp & Lane Machine Co., Akron, O.
Fraser & Chalmers, Chicago, Ill.
Robins Conveying Belt Co., New York City.
Molding Machines—
Tabor Mfg. Co., Elizabeth, N. J.
Mine Pumps—
Fred M. Prescott Steam Pump Co., Milwaukee, Wis.
Molding Sand—
Ohio Sand Co., Conneaut, O.
F. B. Stevens, Detroit, Mich.
S. Obermayer Co., Cincinnati, O.
Garden City Sand Co., Chicago, Ill.
Newport Sand Bank Co., Newport, Ky.
Molders' Tools—
The S. Obermayer Co., Cincinnati, O.
Name Plates—
August Becker, Boston, Mass.
Nickel Plating Outfits—
Northampton Emery Wheel Co., Chicago, Ill.
Nuts and Bolts
Upson Nut Co., Cleveland, O.
Oilless Bearings—
North American Metaline Co., Long Island, City, N. Y.
C. H. Besly & Co., Chicago, Ill.
Oil Burners—
W. S. Rockwell & Co., New York City
American Gas Furnace Co., New York City.
Oil Cups—
C. H. Besly & Co., Chicago, Ill.
Oil Pumps—
C. H. Besly & Co., Chicago, Ill.
Ore Crushers—
The Edward P. Allis Co., Milwaukee, Wis.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.
Ore Screens—
Rob't Aitchison Per. Metal Co., Chicago, Ill.
Harrington & King Per. Co., Chicago, Ill.
The Aultman Co., Canton, O.
Packing—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.
Paint—
Iron Clad Paint Co., Cleveland, O.
Jos. Dixon Crucible Co., Jersey City, N. J.
Standard Paint Co., New York, City.
Pattern Makers' Vises—
Massey Vise Co., Chicago, Ill.
Pattern Works—
Gobeille Pattern Co., Cleveland O.
Perforated Sheet Metal—
Harrington & King Perforating Co., Chicago, Ill
Aitchison Perforated Metal Co., Chicago, Ill.
Fraser & Chalmers, Chicago, Ill.
Pig Iron—
Clinton Iron & Steel Co., Pittsburg.
Forster, Waterbury & Co., Chicago, Ill.
Bourne-Fuller Co. Cleveland, O.
M. A. Hanna & Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
F. B. Stevens, Detroit, Mich.
McKeefrey & Co., Leetonia, O.
Superior Charcoal Iron Co., Grand Rapids, Mich
Hickman & Williams, Chicago, Ill.
Spearman Iron Co., Sharpsville, Pa.
Salisbury Carbonate Iron Co., New York City.
The Brier Hill Coal & Iron Co., Youngstown, O.
Pipe Cleaners—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.
Pipe Covering—
C. H. Besly & Co., Chicago. Ill.
Jenkins Bros., New York City.
Pipe Cutting and Threading Machines—
The Armstrong Mfg. Co., Bridgeport, Conn
Planers—
U. Baird Machinery Co., Pittsburg, Pa.
Bickford Drill & Tool Co., Cincinnati, O.
Planer Chucks—
Massey Vise Co., Chicago, Ill.
Plates—
Enterprise Boiler Co., Youngstown, O.
Plumbago—
The S. Obermayer Co., Cincinnati, O.
Plumbers' and Gas Fitters' Supplies—
C. H. Besly & Co., Chicago, Ill.
Pneumatic Appliances—
Clayton Air Compressor Works, New York.
Pneumatic Tools.—
American Pneumatic Tool Co., New York City
Q & C Co., Chicago. Ill.
Portable Forge—
C. H. Besly & Co., Chicago, Ill.
B. F. Sturtevant Co., Boston, Mass.
Vulcan Mfg. Co., Pittsburg, Pa.
Power Drop Hammers—
Baush & Harris Machine Tool Co., Springfield Mass.
Power Presses—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.
E. Konigslow & Bro. Cleveland, O.
Power Transmission Machinery—
Jeffrey Mfg. Co., Columbus, O.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago. Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.
Presses—
Bertsch & Co., Cambridge City, Ind.
C. H. Besly & Co., Chicago. Ill.
E. Konigslow & Bro. Cleveland, O.
Pressure Gauges—
The Bristol Co., Waterbury, Conn.
Pulleys—
W. A. Jones Foundry Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
E. A. Delano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.
Pumps (Steam)—
The Edward P. Allis Co., Milwaukee, Wis.
Stilwell-Bierce & Smith-Vaile Co., Dayton, O.
Blakeslee Mfg. Co., Du Quoin, Ill.
Fred M. Prescott Steam Pump Co., Milwaukee Wis.
Hall Steam Pump Co., Pittsburg, Pa.

Punches—
E. Konigslow & Bro. Cleveland, O.

Pyrometers—
Edward Brown, Philadelphia, Pa.
Vulcan Mfg. Co., Pittsburg, Pa.

Railway Supplies—
Cleveland City Forge & Iron Co., Cleveland, O.
Garden City Sand Co., Chicago, Ill.

Rivets—
Champion Rivet Co., Cleveland, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.

Riveted Steel Pipe—
The Wm. B. Pollock Co. Youngstown, O.

Rock Drills—
Rand Drill Co., Chicago, Ill.
The Ingersoll-Sergeant Drill Co., New York.

Rolling Mill Machinery.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.

Roofs—
Shiffler Bridge Co., Pittsburg.
Riter-Conley Mfg. Co., Pittsburg, Pa.

Sand and Chill Rolls—
Seaman, Sleeth Co., Pittsburg, Pa.

Saws—
Peter Gerlach & Co., Cleveland, O.

Screens for Coal Ore, Etc.
Robt. Aitchison Perforated Metal Co., Chicago.
Harrington & King Perforating Co., Chicago.
Jeffrey Mfg. Co., Columbus, O.
The Aultman Co., Canton, O.

Screws—
C. H. Besly & Co., Chicago, Ill.
Upson Nut Co., Cleveland, O.
Chicago Screw Co., Chicago, Ill

Seamless Tubes—
Shelby Steel Tube Co., Cleveland, O.

Shafting—
The Lane & Bodley Co., Cincinnati, O.
E. A. Deiano, Chicago, Ill.
Dodge Mfg. Co., Mishawaka, Ind.
Fitzsimmons & Co., Cleveland, O.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.
I. & E. Greenwald Co., Cincinnati, O.

Shapers—
Baush & Harris Machine Tool Co., Springfield, Mass.

Shearing and Punching Machinery—
Bertsch & Co., Cambridge City, Ind.
Fox Machine Co., Grand Rapids, Mich.

Sheet Iron—
Cleveland Rolling Mill Co., Cleveland, O.
Ætna-Standard Iron & Steel Co., Bridgeport, O.
E. H. Stroud & Co., Chicago, Ill.

Ship Yards—
Wm. Cramp & Sons, Philadelphia, Pa.

Special Machinery—
Edwin Harrington Son & Co., Philadelphia.
Q & C Co., Chicago, Ill.
The Aultman Co., Canton, O.
Jeffrey Mfg. Co., Columbus, O.
E. Konigslow & Bro. Cleveland, O.
Wheeling Mold & Foundry Co., Wheeling, W. Va.

Stand Pipes—
The Wm. B. Pollock Co., Youngstown, O.

Steam Boiler Inspectors—
Hartford Steam Boiler Inspection & Insurance Co., Hartford, Conn.

Steam Pipe and Boiler Covering—
C. H. Besly & Co., Chicago Ill.

Steam Packing—
C. H. Besly & Co., Chicago, Ill.

Steam Pumps—
Hall Steam Pump Co., Pittsburg, Pa.
Stilwell-Bierce & Smith-Vail Co., Dayton, O.
Blakeslee Mfg. Co., Du Quoin, Ill.

Steam Shovels and Dredges—
Marion Steam Shovel Co., Marion, O.
The Bucyrus Co., South Milwaukee, Wis.

Steam Specialties—
C. H. Besly & Co., Chicago, Ill.

Steel—
Otis Steel Co., Cleveland, O.
E. H. Stroud & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
The Morris & Bailey Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.
Byron H. White, Chicago, Ill.

Steel Castings—
Otis Steel Co., Cleveland, O.
Q & C Co., Chicago, Ill.

Steel Plants—
The Wm. B. Pollock Co., Youngstown, O.
The Riter-Conley Co., Pittsburg, Pa.

Steel Blooms and Billets—
Cleveland Rolling Mill Co., Cleveland.
Bethlehem Iron Co., South Bethlehem, Pa.
Ohio Steel Co., Youngstown, Ohio.
The Lorain Steel Co., Lorain, O.
Jones & Laughlins, Ltd., Pittsburg, Pa.

Steel Stamps and Steel Dies—
J. H. Fleharty & Co., Cleveland, O.

Steel Tanes—
Shelby Steel Tube Co., Cleveland, O.

Stokers—
Playford Stoker Co., Cleveland, O.

Tanks—
Enterprise Boiler Co., Youngstown, O.
Meehan Boiler & Construction Co., Lowellville, Ohio.
The Wm. B. Pollock Co., Youngstown, O.
Riter-Conley Mfg. Co., Pittsburg, Pa.
The Aultman Co., Canton, O.

Tank Cars—
The Wm. B Pollock Co., Youngstown, O.

Tin and Terne Plates—
E. H. Stroud & Co., Chicago, Ill.
American Tin Plate Company, Chicago, Ill.

Tin Plate Machinery.
Totten & Hogg Iron and Steel Foundry Co., Pittsburg, Pa.

Tool Steel—
C. H. Besly & Co., Chicago, Ill.
Bræburn Steel Co., Bræburn, Pa.
Crescent Steel Co., Pittsburg, Pa.
La Belle Steel Co., Pittsburg, Pa.
Sanderson Bros. Steel Co., Cleveland, O.

Transmission Machinery—
Heyl & Patterson, Pittsburg, Pa.
Link-Belt Machinery Co., Chicago, Ill.
The Lane & Bodley Co., Cincinnati, O.
W. A. Jones Foundry & Machine Co., Chicago, Ill
Jeffrey Mfg. Co., Columbus, O.
Dodge Mfg. Co., Mishawaka, Ind.
The Aultman Co., Canton, O.
Brown Hoisting and Conveying Machine Co., Cleveland, Ohio.

Tubes—
National Tube Works, McKeesport, Pa.
Shelby Steel Tube Co., Cleveland, O.

Tube Cleaners—
Union Boiler Tube Cleaner Co., Pittsburg, Pa.

Tube Welding—
S. Fix Sons, Cleveland, O.

Tumbling Mills—
The S. Obermayer Co., Cincinnati, O.

Turnbuckles—
Cleveland City Forge & Iron Co., Cleveland, O.

Twist Drills—
C. H. Besly & Co., Chicago, Ill.

Twist Drill Cases—
Vulcan Mfg. Co., Pittsburg, Pa.

Valves—
C. H. Besly & Co., Chicago, Ill.
Jenkins Bros., New York City.

Ventilating Fans—
B. F. Sturtevant Co., Boston Mass.

Vises—
Massey Vise Co., Chicago, Ill.

Wire Coating.
The Ironsides Company, Columbus, O.

Wire Filler
The Ironsides Company, Columbus, O.

Wire Machinery—
The F. B. Shuster Co., New Haven, Conn.
S. W. Goodyear, Waterbury, Conn.

Wire Nails—
Cleveland Rolling Mill Co., Cleveland, O.

Wire Rope Coating.
The Ironsides Company, Columbus, O.

Wire Rope Filling.
The Ironsides Company, Columbus, O.

Wood Pulleys—
Dodge Mfg. Co., Mishawaka, Ind.

Wrought Pipe—
National Tube Works, McKeesport, Pa.

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The star (*) indicates that the adv. appears alternate weeks; the dagger (†) once a month; the double dagger (‡) once in three weeks; the parallel (‖) three times out of four.

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Harrington & King Perforating Co	1
Harrington Son & Co., Edwin	23
Harrison Safety Boiler Works	21
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Heyl & Patterson	30
†Hickman & Williams	—
Holmes, Strachan & Co	32
Hooven, Owens & Rentschler Co	26
Hunt Robt. W., & Co	2
Illinois Central R. R	24
Ingersoll-Sargent Drill Co	2
Iron Clad Paint Co	40
Ironsides Co	22
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Jones & Co., John T	2
Jones Foundry & Machine Co., W. A	1
Jones & Laughlins, Ltd	41
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†Modern Machinery	—
Morris & Bailey Steel Co	37
*National Engraving Co	—
National Tube Works Co	43
†Newport Sand Bank Co	—
Northampton Emery Wheel Co	38
Nuttall Co. The R. D	26
Oak Hill Fire Brick & Coal Co	23
Obermayer, S. & Co	34
Oglebay, Norton & Co	28
†Ohio Sand Co	—
Ohio Steel Co	28
Otis Steel Co	37
†Parkhurst & Wilkinson Co	—
Perfect Lubricating Metal Co	44
Phœnix Horse Shoe Co	43
Playford Stoker Co	40
Pollock, The Wm. B. Co	2
Prescott Steam Pump Co	39
Q & C Co	21
Rand Drill Co	2
Reading Crane & Hoist Works	30
Riter-Conley Mfg. Co	31
Riverside Foundry Co	22
Robins Conveying Belt Co	31
*Rockwell & Co., W. S	1-24
Ryan, J. J. & Co	37
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Sanderson Bros. Steel Co	37
Seaman, Sleeth Co	42
Sennett Co., Geo. B	39
Scioto Star Fire Brick Works	32
Sharon Fire Brick Works	1
Shelby Steel Tube Co	2
Shiffler Bridge Co	31
Shuster, The F. B., Co	27
Skinner Chuck Co	27
Spearman Iron Co	44
Standard Paint Co	23
Stevens, F. B	44
Stilwell-Bierce & Smith-Vaile Co	2
Stroud & Co., E. H	2
Sturtevant Co., B. F	1-25
*Superior Charcoal Iron Co	—
Swarts Metal Refining Co	1
Tabor Mfg Co	32
Textor, O	2
Tod Wm. & Co	39
Totten & Hogg Iron and Steel Foundry Co	42
Union Mining Co	22
Union Boiler Tube Cleaner Co	1
United States Hotel Co	38
Upson Nut Co	1
Van Dorn & Dutton Co	26
Vulcan Mfg. Co	30
Washington Coal and Coke Co	33
Webster, Camp & Lane Machine Co	23
Webster Fire Brick Co	1
We Fu Go Co	31
Wheeling Mold & Foundry Co	44
White, Byron H	37
Wyman & Gordon	43

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FINE TOOL STEEL AND FORGINGS. ALSO SPRING HAMMER, AND MACHINERY STEEL OF HIGH QUALITY. FINE OPEN-HEARTH STEEL.

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NO TROUBLE
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Cleveland Warehouse, 97 Water St.

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FLAT & COILED FOR STAMPING DRAWING SPRINGS BLANKING ETC
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PNEUMATIC TOOLS
For Chipping, Calking and Beading

If you want a pneumatic tool which will calk a six foot boiler. ⅝ in. stock, 3 courses, all circular and horizontal seams, both heads, and bead all tubes in less than 5 hours with 60 lbs. air pressure. (Kendall & Sons, Cambridgeport, Mass., caulked a six foot boiler to 150 test in 2 hours and forty-five minutes.)

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If you want a tool which will calk up to 1¼ in. and will chip ⅜ in x11-16 in. x1¼ per minute order our "G" Tool. We ship on 10 days trial with guarantee.

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IRON ORE.

[On Lake Erie docks.]

Special low-phosphorus hard Ore, Bessemer	$3 75
No. 1 Specular, Bessemer	3 15@3 50
No. 1 Bessemer hematite	2.75@3 25
Hematites No. 1 non-Bessemer	1.90@2.10
No 1. Specular, non-Bessemer	2.00@2.00
Mesabi Bessemer	1.80@2.00

PIG IRON.

CLEVELAND (f. o. b. cars):	
Bessemer	$15 15
No. 1 Strong Foundry	$15 65@16 00
No. 2 Strong Foundry	15 15@15 40
Gray Forge, red short	14 65
Gray Forge, neutral	14 10
No. 1 American Scotch	15 75@16 00
No. 2 American Scotch	15 40@15 65
Lake Superior Charcoal	16 50@17 00
PITTSBURG:	
No. 1 Foundry	15 75@16 00
No. 2 Foundry	15 50@15 75
Gray Forge	14 [illegible]@14 5[illegible]
White and Mottled	13 50
Warm Blast Charcoal	17 00
Cold Blast Charcoal	20 00@20 00
Bessemer	15 15@15 [illegible]
CHICAGO:	
Lake Superior Charcoal	$17 00@$18 00
Local Coke Foundry No. 1	15 50@15 75
Local Coke Foundry No. 2	15 00@15 50
Local Coke Foundry No. 3	14 50@14 75
Local Scotch Foundry No. 1	15 50@15 75
Local Scotch Foundry No. 2	15 00@15 50
Local Scotch Foundry No. 3	14 50@14 75
Southern Coke No. 1	16 00@16 25
Southern Coke No. 2	15 25@15 75
Southern Coke No. 3	14 75@15 00
Southern No. 1 Soft	15 50@16 00
Southern No. 2 Soft	15 00@15 50
Southern Silveries	15 50@16 00
Jackson Co. Silveries	17 00@18 00
Ohio Silveries No. 1	[illegible]
Ohio Strong Softeners	15 50@16 50
Alabama Car Wheel	17 50@18 00
Malleable Bessemer	15 50@16 00
Coke Bessemer	15 50@16 00
CINCINNATI (reported by Rogers, Brown & Co.	
Southern Coke No. 1, Foundry	$14 75@15 75
Southern Coke No. 2 and No. 1 Soft	14 25@14 75
Hanging Rock Charcoal No. 1, Fdy	17 00@18 00
Tennessee Charcoal No 1	15 00@16 00
Jackson County Silvery No 1	16 00@16 25
Southern Coke, Gray Forge	12 75@13 00
" " Mottled	12 75@13 00
Standard Georgia Car Wheel	15 50@16 00
Lake Superior " "	15 [illegible]@16 00
BUFFALO:	
No. 1 Foundry Strong Coke Iron Lake Superior Ore	$14 25
No. 2 Foundry Strong Coke Iron Lake Superior Ore	13 75
Ohio Strong Softener No. 1	14 00
Ohio Strong Softener No. 2	13 50
Jackson Co. Silvery No. 1	15 60
Southern Soft No. 1	15 25
Southern Soft No. 2	14 75
Lake Superior Charcoal	14 00@14 50
Coke, Malleable	14 10
ST. LOUIS:	
Southern Coke No 1	$14 75
Southern Coke No. 2	14 25
Southern Coke No. 3	13 75
Southern Coke No. 4	13 55
Southern Gray Forge	13 30
Tennessee Charcoal No 1	13 75
Jackson County 2 per cent Silicon	16 25
Lake Superior Coke No. 1	15 00@16 [illegible]
Southern Car Wheel	15 25@16 25
Genuine Connellsville Coke	4 15
West Virginia Coke	4 10

OLD RAILS AND SCRAP METAL.

[Delivered Cleveland.]	GROSS TONS
Old iron rails	$18 00
Old steel rails (6 ft. and over)	14 00
Old steel rails (6 ft. and under)	14 00
Old car wheels	16 00
	NET TONS
No. 1 R. R. wrought scrap	$16 50
Mill scrap	11 50
No. 1 Machine cast scrap	13 50
Iron axles	19 00
Axle turnings	11 00
Wrought turnings (free from cast)	10 00
Cast borings	7 50
Uncut wrought iron boilers	7 00
Steel boiler plates	11 00
Grate bars	8 00
Pipes and flues (clean)	10 00
Tank iron	12 00
Hoop and band iron	9 00
Sheet iron	8 00
Wrought drillings	10 00
Malleable iron	10 50

STRUCTURAL MATERIAL.

Beams and Channels (f. o. b. Cleveland)	1.50c
Angles	1.50c
Tees	1.50c
Universal Plates	1.80@1.90c
Sheared Plates	2.00c

MERCHANT IRON AND STEEL.

[Less than car-lots, Cleveland.]
Rounds and Squares.—Bar Iron.

1 to 1⅜	1.50 Base.
2 to 2½	.20 extra.
3 to 3½	.50 "
3⅝ to 4	.80 "
4¼ to 4⅝	1.00 "
4¾ to 5	1.30 "
5¼ to 6	1.80 "
5¼ to 6½	[illegible] "

BABBITT METALS

All standard and special grades.
In sectional molds or bars.

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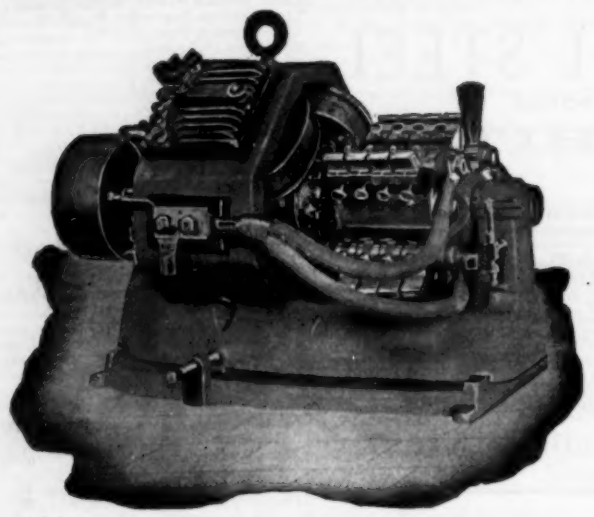

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6⅜ to 7¼	2.50 extra
¼ to ⅜	.10 "
⅜ to 11-16	.20 "
½ to 9-16	.30 "
7-16 to 15-32	.40 "
⅜ to 13 2	.50 "
5-16 to 32	.70 "
¼ to 9-32	.90 "
7-32	1.40 "
3-16	2.50 "

Flats.—Bar Iron.

1½ to 4 x ⅜ to 1	1.05 Base
4¼ o 6 x ⅜ to 1	.10 extra
6¼ o 8 x ⅜ to 1	.60 "
8¼ o 10 x ⅜ to 1	.80 "
1⅜ o 4 x 1 1-16 to 1½	.30 "
4¼ to 6 x 1 1-16 to 1½	.40 "
6¼ to 8 x 1 1-16 to 1½	.60 "
8¼ to 10 x 1 1-16 to 1½	.90 "
2 to 4 x 1⅝ to 2	.50 "
4¼ to 6 x 1⅝ to 2	.60 "
6¼ to 8 x 1⅝ to 2	.80 "
8¼ to 10 x 1⅝ to 2	1.00 "
2 to 4 x 2⅛ to 3	.60 "
4¼ to 6 x 2⅛ to 3	.80 "
6¼ to 8 x 2⅛ to 3	1.00 "
1⅜ to 1⅜ x ⅜ to 1	.10 "
1 to 1 1-16 x ⅜ to ⅞	.20 "
¼ to 15-16 x ⅜ to ¾	.40 "
⅜ to 11-16 x ⅜ to ⅝	.50 "
¼ to 9-16 x ⅜ to ½	.90 "

Heavy Band Iron.

7 to 10 x ¼ to 5-16	.70 extra.
6¼ to 6¾ x ¼ to 5-16	.50 "
4¼ to 6 x ¼ to 5-16	.30 "
1⅜ to 4 x ¼ to 5-16	.20 "
1 to 1⅜ x ¼ to 5-16	.30 "
½ to 15-16 x ¼ to 5-16	.50 "
⅜ to 11-16 x ¼ to 5-16	.80 "
⅛ to 9-16 x ¼ to 5-16	1.00 "
⅛ to 7-16 x ¼ to 5-16	1.50 "

Heavy bands, 7-32 in. thick 1-10 c. per lb. higher than ¼ to 5-16 thick. **Bevel Edge Shaft Iron** 1-10 higher than same size of Heavy Bands.

Light Band Iron.

7 to 8 x No. 9 to 3-16	.90 extra
7 to 8 x Nos. 10, 11 and 12	1.00 "
6¼ to 6¾ x No. 9 to 3-16	.70 "
6¼ to 6¾ x Nos. 10, 11 and 12	.80 "
4¼ to 6 x No. 9 to 3-16	.50 "
4¼ to 6 x Nos. 10, 11 and 12	.60 "
1¼ to 4 x No. 9 to 3-16	.40 "
1¼ to 4 x Nos. 10, 11 and 12	.50 "
1 to 1 3-16 x No. 9 to 3-16	.50 "
1 to 1 3-16 x Nos. 10, 11 and 12	.60 "
13-16 to ⅞ x No. 9 to 3-16	.60 "
13-16 to ⅞ x Nos. 10, 11 and 12	.70 "
11-16 to ¾ x No. 9 to 3-16	.80 "
11-16 to ¾ x Nos. 10, 11 and 12	.90 "
9-16 to ⅝ x No. 9 to 3-16	1.00 "
9-16 to ⅝ x Nos. 10, 11 and 12	1.10 "
7-16 to ½ x No. 9 to 3-16	1.30 "
7-16 to ½ x Nos. 10, 11 and 12	1.40 "
⅛ x No. 9 to 3-16	1.50 "
⅛ x Nos. 10, 11 and 12	1.60 "

Bevel Edge Box Iron.

Same as Light Bands, of same sizes.

Beaded Band Iron, 1¼ in. to 2 in.

Sand Band Iron, 1-10 c. above same sizes o Light Bands.

Oval Iron.

⅛ to 1½	.40 extra
¾ to 13-16	.50 "
⅝ to 11-16	.60 "
½ to 9-16	.80 "
⅜ to 7-16	1.10 "
⅛ to 9-16 x 3-16	1.00 "
⅜ to 11-16 x ¼	1.20 "

Half Oval and Half Round.

2¼ to 3	.60 extra
⅞ to 2	.50 "
¾ to 13-16	.70 "
⅝ to 11-16	.90 "
½ to 9-16	1.20 "
⅜ to 7-16	2.50 "
5-16	3.50 "
¼	4.50 "

Half Ovals less than ¼ their width in thickness, extra price.

Horse Shoe Iron.

All sizes 1 c. extra.

Cutting ordinary bars to specified length, .20 to .30 extra, according to length and size.

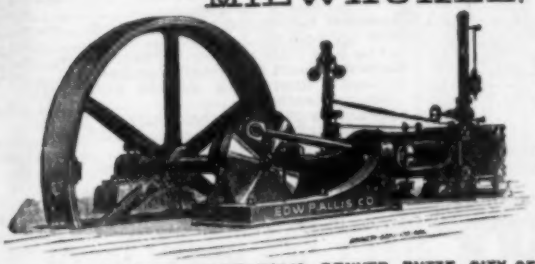
Steel Bands.

Width In Inches.	English Standard Gauge.		
1 1-2 to 6,	Nos. 7, 8, 9 or 3-16"	1.50 Base. Extras.	
1⅜ to 6,	" 10, 11, 12 or ¼"	.05	per 100 lbs.
1 to 1⅜,	" 7, 8, 9 or 3-16"	.10	"
1 to 1⅜,	" 10, 11, 12 or ¼"	.15	"
13-16 and ⅞,	" 7, 8, 9 or 3-16"	.20	"
13-16 and ⅞,	" 10, 11, 12 or ¼"	.25	"
11-16 and ¾,	" 7, 8, 9 or 3-16"	.30	"
11-16 and ¾,	" 10, 11, 12 or ¼"	.35	"
9-16 and ⅝,	" 7, 8, 9 or 3-16"	.40	"
9-16 and ⅝,	" 10, 11, 12 or ¼"	.45	"
½, Nos.	7, 8, 9 or 3-16"	.55	"
½, "	10, 11, 12 or ¼"	.60	"
7-16 "	7, 8, 9 or 3-16"	.75	"
7-19 "	10, 11, 12 or ¼"	.85	"
⅜, "	7, 8, 9 or 3-16"	.95	"
⅜, "	10, 11, 12 or ¼"	1.05	"

Iron and Steel Hoops.

Width Inches.	English Standard Gauge.		
7-16 to 3	Nos. 13, 14, 15 and 16	1.60 Base. Extras.	
7-16 to 2,	" 17, 18, and 19	.05	per 100 lb
7-16 to 2,	" 20	.10	"
7-16 to 2,	" 21	.15	"
7-16 to 1¼,	" 22	.25	"
⅝ to 1¼,	" 13, 14 and 15	.05	"
⅝ to 1¼,	" 16, 17 and 18	.10	"

THE EDWARD P. ALLIS COMPANY
MILWAUKEE, WIS.



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Reynolds Corliss Engines.

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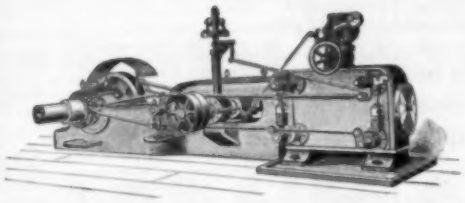
CINCINNATI, OHIO.



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ALL SIZES.

Simple and Compound.

Shafting, Hangers, Pullevs.

Belt Elevators, Saw Mills.

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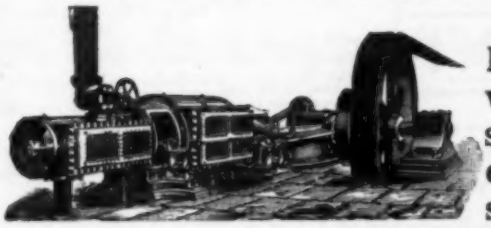
YOUNGSTOWN, OHIO.

The Porter-Hamilton Engine



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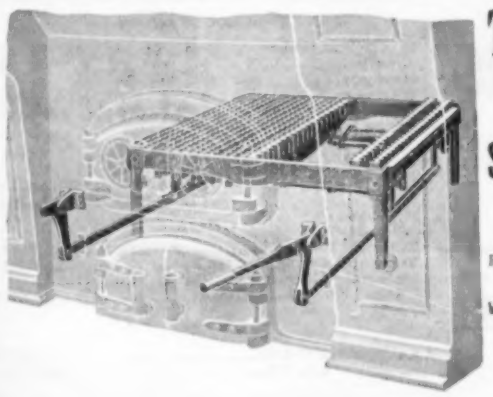
PRESCOTT.

Fred. M. Prescott Steam Pump Co.,

MILWAUKEE, WIS.



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Manufacturers of the

SENNETT ROCKING GRATE.

ECONOMY OF FUEL.
ECONOMY OF TIME.

Prevents large clinkers. Convenient and Substantial. Apply for circulars.

We make also SENNETT ENGINE, 20 to 40 H. P.
SENNETT COMPRESSION COUPLING
and CASTINGS to 5 tons each.

1⅛ to 1⅜,	"	19 and 20	per 100 lbs.
1⅛ to 1⅜,	"	21	.20 "
1⅛ to 1⅜,	"	22	.30 "
15-16 and 1,	"	13, 14 and 15	"
15-16 and 1,	"	16, 17 and 18	.15 "
15-16 and 1,	"	19 and 20	.20 "
15-16 and 1,	"	21	.25 "
15-16 and 1,	"	22	.35 "
⅞, Nos.	13, 14 and 15		.20 "
⅞, "	16, 17 and 18		.25 "
⅞, "	19 and 20		.30 "
⅞, "	21		.35 "
⅞, "	22		.45 "
¾ and 13-16 Nos.	13, 14 and 15		.30 "
¾ and 13-16 "	16, 17 and 18		.35 "
¾ and 13-16 "	19 and 20		.40 "
¾ and 13-16 "	21		.45 "
¾ and 13-16 "	22		.50 "
¾ and 13-16 "	23		.60 "
11-16, Nos.	13, 14 and 15		.35 "
11-16, "	16, 17 and 18		.40 "
11-16, "	19 and 20		.50 "
11-16, "	21		.60 "
11-16, "	22		.70 "
11-16, "	23		.80 "
⅝, Nos.	13, 14 and 15		.40 "
⅝, "	16, 17 and 18		.45 "
⅝, "	19 and 20		.55 "
⅝, "	21		.65 "
⅝, "	22		.75 "
⅝, "	23		.85 "
9-16, "	13, 14 and 15		.45 "
9-16, "	16, 17 and 18		.50 "
9-16, "	19 and 20		.60 "
9-16, "	21		.70 "
9-16, "	22		.80 "
9-16, "	23		.90 "
½, "	13, 14 and 15		.55 "
½, "	16, 17 and 18		.60 "
½, "	19 and 20		.70 "
½, "	21		.80 "
½, "	22		.90 "
½, "	23		1.00 "
7-16, "	13, 14 and 15		.80 "
7-16, "	16, 17 and 18		.90 "
7-16, "	19 and 20		1.00 "
⅜, "	13, 14 and 15		1.00 "
⅜, "	16, 17 and 18		1.10 "
⅜, "	19 and 20		1.20 "

Sheet Iron.

No. 10	1 50
No. 12	1 70
No. 14	1 60
No. 15-17	1 75
No. 18	1 85
No. 20	2 00
No. 22-24	2
No. 25-26	2 20
No. 27	2 30

English Tool Steel.

Jessop's	15½c
Hobson's "Best"	15½c
" "Choice"	35c

Steel Boiler Plates—1-4 in. and Heavier.

Tank	1 35
Shell	1 45
Flange	1 55
Marine Flange	1 60
Fire Box	2 05

Above includes plates 90 inches wide.

90 to 96 in. wide	½c. lb. extra
96 to 100 in. wide	1c. "
100 to 104 in. wide	1½c. "
104 to 106 in. wide	special.

Flats.	cts. lbs.
2 to 9-16 in. wide by 2 to ½ thick	.08

Bessemer and O. H. Steel.

Bessemer Machinery	base price,	1 40
Open-hearth Tire	"	1 45
Open-hearth Spring	"	1 60
Sleigh Shoe	"	1 45
Toe Calk	"	1 90
Cutter Shoes, tapered and bent	"	1 60

American Cast Tool Steel.

ROUND, SQUARE, AND OCTAGON.	cts. lbs.
1 to 2 in. inclusive	.08
9-16 to ⅞ in. "	.08
7-16 to ⅝ and 2⅛ to 3 in.	.09
3⅛ to 4 in.	.09½
⅝ to 11-16 and 4⅛	.10
⅛ to 6 in.	.10½
¼ to 9-32 and 6¼ to 7 in.	.11
1 in.	.13

Burden Boiler Rivets.

⅛, ¾, 11-16 and ⅞ inches diameter	3 00
Bridge ⅛, ⅝, 11-16 and ¾ inch diam.	2 55

Wrought Pipe and Boiler Tubes.

Lap weld black, base, and 10 per cent.				.78
Butt " "	"	"		.72
Lap " galv.	"	"		.70
Butt " "	"	"		.67
Boiler tubes 2¼" and smaller				.72½
Boiler tubes 2½" and larger				.72
Casting screw and socket joint				dis. 50
Casing inserted joint				dis. 45

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[From Store, Cleveland.]

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Magnolia Anti-Friction Metal, 25 cts. per lb., f. o. b New York or Chicago.
No Name Metal, 15 cts. per lb., f. o. b. New York or Chicago.
Mystic Metal, 10 cts. per lb., f. o. b. New York or Chicago.

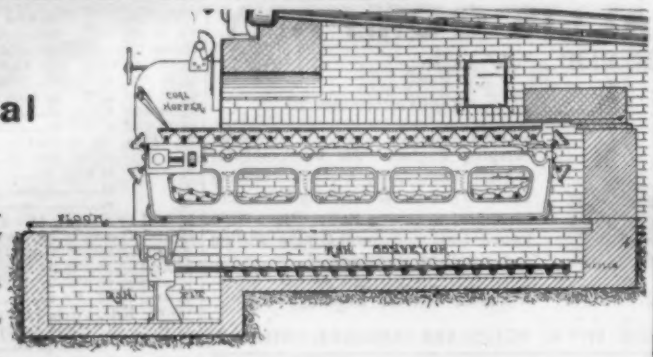
Anvils.

American	₩ lb 9@11
Wright's	₩ lb 12

Bellows.

Blacksmiths'	Hill's	dis
	Bullock's	dis 50 & 1
Moulders'		dis 40@40&10
Hand		dis 40&10@50

The Playford Mechanical Stoker



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" " " extra	dis 60&10
" " " best	dis 55
Cleveland Rubber Co. extra standard	dis 60&10
Hoyt's Short Lap	dis 50
Shultz Raw Hide Leather Belting, single	dis 40
Munson's Short Lap Single Leather	dis 50
Munson's Short Lap Double and Light Double Leather	dis 50&10
Shultz Raw Hide Leather Belting, Double and Light Double	dis 40
Standard, oak tanned	dis 50&10
Alexander Brothers' pure oak tanned	dis

Blowers and Exhausters.

B. F. Sturtevant's	dis 20
Boston Blower Co.	dis 35

Chucks.

Cushman's 4 Jaw Independent	dis 45
" Combination	dis 40
" Geared Scroll	dis 80
" 2 Jaw Brass Workers	dis 30
" Drill	dis 35
Wescott's Scroll Combination	dis 33⅓
" Independent	dis 40
" Little Giant Drill	dis 33⅓
Horton's Independent	dis 45
Whiton's Independent	dis 45
National Combination	dis 45
Sweetland "	dis 40
Almond Drill	dis 40
Morse "	dis 20
Skinner's Combination Lathe	dis 40&15
" Independent Lathe	dis 40&10
" Universal Lathe	dis 40&10
" Drill	dis 30

Cutters and Reamers.

Cleveland	dis 10@1
Pratt & Whitney	dis 10@1
Standard	dis 10@1
Morse	dis 10 to 1
Brown & Sharpe, Milling Cutters	dis 1
" " Gear Cutters	dis 1

Crowbars.

Cast Steel	₩ 3¼
Iron, steel points	₩ lb 1

Drill and Drill Sockets.

Twist Drills	
Morse Taper & Straight Shank to 1¼"	dis 50 & 10 to 60
Morse Taper and Straight Shank Larger than 1¼"	dis 25
Drill Sockets	dis 25
Standard Twist Drills	dis 60@60&5
Cleveland " "	dis 60@60&5

Emery.

	No. 4 to No. 54 46 gr.	150 gr.	Flour, C. F
Kegs, ₩ lb	4½c	5 c	2½c
½ kegs ₩ lb	4¾c	5¼c	2¾c
¼ kegs ₩ lb	5 c	5½c	3 c
10 lb cans, 10 in case	6 c	6¼c	c
10 lb cans less than 10	12 c	10 c	¼c

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Barder, Adamson & Co.	dis 50@50&5
H. H. Barton	dis 50@50&5

Emery Wheels.

Detroit	dis 60@70
Norton's	dis 60@70
Crant	dis 60@70
Sterling	dis 60@70
Celluloid	dis 10&33⅓
Northampton	dis 50
Crystal	dis 65@70
Vitrified	dis 60@70
Vulcanite	dis 60&10
Hamden	dis 60&10@70
Cyclone	dis 60@60&10

Files.

Arcade	dis 60&10@60&10&10
Nicholson	dis 60&10@60&10&10
" X. F	dis 25
Kearney & Foot	dis 60&10@60&10&10
Black Diamond	dis 60&10@60&10&10
McClellan	dis 60&10@60&10&10
Disston's	dis 65@70
Western	dis 70
Stub's	dis 2
Grobet's	dis 30
Reynolds Bros.' Hand Cut	dis 55
Industry File Works Hand Cut	dis 50

Hammers.

P. S. W	dis 40
Atha new list, Jan. 15, 1887	dis 50
Heavy hammers and sledges under 5 lbs	10c
" " " " over 5 lbs	8c

Jack Screws.

Illinois Bolt Co. list	dis 75

Nuts and Washers.

Size of bolt inches	¼	5-16	⅜	½	⅝	¾	1
Square	8	7	5½	4½	4	3½	3⅛
Hexagon	15⅝	11⅛	8½	6	5⅜	5⅛	
Washers	9	8	7	5	4½	4⅛	4⅛

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Car lots $1.30
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" 6 to 7 lbs	dis $ 13 60

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Marietta, Wheeling & Chicago	†9:25 P M	†7:25 A M
Cleveland Press Special.....	†9:25 P M	†2:00 P M
Akron, Canton & Wheeling...	*10:20 A M	*3:30 P M
Akron, Canton & Chicago.....	*8:05 A M	*6:35 P M
Akron, Canton & Marietta....	†2:10 P M	†11:00 A M
Pittsburg, Washington, D. C. & Baltimore.....	† 2:10 P M	†11:00 A M

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Time Table effective May 15th, 1898.
Cleveland Depot: Foot of South Water Street.
Elyria Depot: Huron St., West Side.

South Bound.			Central Standard. Lorain Branch	North Bound.		
15	13	11		12	14	16
P.M.	P.M.	A.M.	LV. AR.	A.M.	A.M.	P.M.
4:25	2:25	6:27	Lorain	9:15	11:35	7:30
4:40	2:30	6:44	Elyria.....	9:00	11:21	7:16
4:56	2:55	7:04	Grafton	8:43	11:07	6:58
5:15	3:12	7:23	Lester....	8:25	10:50	6:40
5	3	1	Main Line	2	4	6
5:30	2:25	7:20	Cleveland	8:30	11:50	7:15
5:47	2:41	7:36	Brooklyn	8:14	11:34	7:01
6:42	3:26	8:22	Lester.....	7:29	10:49	6:19
6:52	3:35	8:30	Medina.....	7:16	10:37	6:07
7:05	3:46	8:41	Chippewa La	7:04	10:26	5:55
7:20	4:01	8:56	Sterling.....	6:48	10:12	5:40
8:09	4:46	9:45	Massillon	6:00	9:23	4:54
8:55	5:31	10:34	Canal Dover.	5:11	8:36	4:10
9:02	5:38	10:41	New Philade	5:04	8:28	4:03
9:20	6:05	11:25	Uhrichsville	4:45	8:10	3:45
.....	8:10	1:30	Bridgeport ...	.....	6:05	1:40
.....	8:25	.....	Bellaire.....	.....	5:50	.....
P.M.	P.M.	P.M.	AR. LV.	A.M.	A.M.	P.M.

No. 9 leaves Lorain 9:50 a.m., Elyria 10:05, Grafton 10:21; arrives Lester Junction 10:40. No. 10 leaves Lester Junction 3:25 p.m., Grafton 3:42, Elyria 3:57; arrive Lorain at 4:10 p.m.

Trains 1, 2, 5 and 6 daily between Cleveland and Urichsville. All other trains daily except Sundays. Electric cars between Bridgeport and Wheeling, and Bridgeport and Martins Ferry and Bellaire. Consult agents for general information as to the best routes and passenger rates to all points. M. G. CARREL, G. P. A.,
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To the Iron and Steel Works of the United States for 1898.

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The American Iron and Steel Association has just completed a thorough revision of its Directory to the Iron and Steel Works of the United States, bringing down to April, 1898, a description of these works. It also contains a complete Directory to many leading industries which are large consumers of iron and steel. This edition, which is the fourteenth that has been issued, embraces more complete details of all the iron and steel works of the United States, and of industries which are large consumers of iron and steel, than any preceding edition. It retains all the old features of preceding editions and contains many new features.

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The lists of Plate and Sheet Mills and of Tin Plate and Stamping Works are much more complete than in previous editions. The names and location of all the works described are given in alphabetical order, followed by a description o their character, capacity and products, with the names of the principal officers, etc., including the names of selling agents. This edition makes a cloth-bound book of nearly 400 well-printed pages—many more than in any previous edition. It contains a complete list of all the

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Rolling Mills,
Bessemer Steel Works,
Open-Hearth Steel Works,
Crucible Steel Works,
Plate and Sheet Mills,
Rail Mills,
Structural Mills,
Steel Casting Works,
Cut-Nail Works,
Tin Plate Works,
Stamping Works,
Forges and Bloomaries,
Wire Rod and Wire Mills,
Wire Nail Works,
Iron and Steel Bridge Builders,
Iron and Steel Ship Builders,
Horse-Nail Works,
Locomotive Works,
Malleable Iron Works,
Cast Iron Pipe Works,
Cast Iron Soil and Plumbers' Pipe Works,
Wrought Iron, Wrought Steel and Riveted Pipe Works,
Seamless Tube Works,
Chain Works,
Bolt, Nut and Rivet Works,
Car Axle Works,
Car Wheel Works, and
Car Builders in the United States

ALSO A LIST OF THE

Iron and Steel Works in Canada and Mexico.

This edition of the Directory is an invaluable book of reference for all business men who wish to correspond with iron and steel manufacturers or with iron and steel consumers, forming, in every respect, a COMPLETE GUIDE to the iron and steel works of this country and to the principal works which consume iron and steel.

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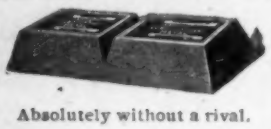

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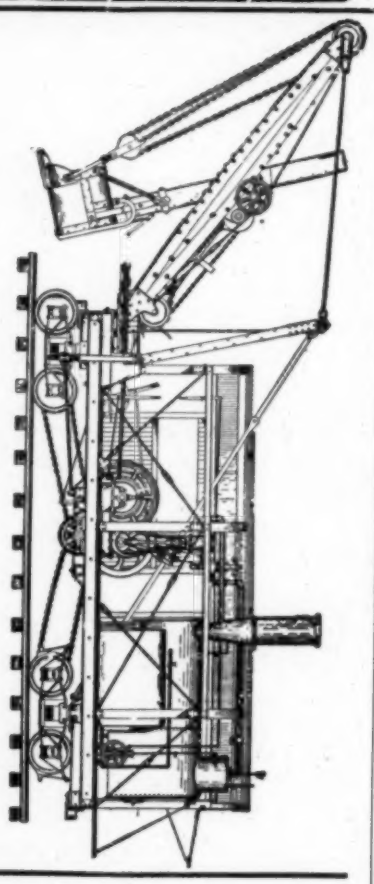

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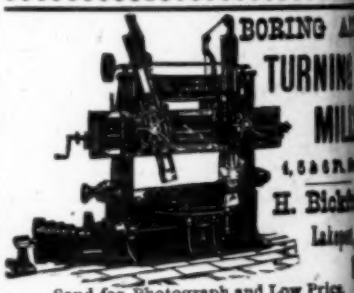

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